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B.S.B.I. Conference Reports, Number Eight

THE CONSERVATION OF THE
BRITISH FLORA

THE CONSERVATION OF THE BRITISH FLORA

BEING THE REPORT OF THE
CONFERENCE

HELD IN 1963

BY

THE BOTANICAL SOCIETY OF
THE BRITISH ISLES

EDITED BY

E. MILNE-REDHEAD

1963

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EDITORIAL

THE Botanical Society of the British Isles has taken an active part in conservation since 1950. The Hon. General Secretary's Report for that year (*B.S.B.I. Yearbook for 1951*, p. 28) contains this sentence: "Following a suggestion communicated to the Conference [on the Aims and Methods in the Study of the Distribution of the British Flora held in 1950] by Capt. Cyril Diver, Director-General of the Nature Conservancy, the Society has entered into close collaboration with his official organization and it is anticipated that this will prove an important step in furthering our object of the conservation of the British flora." As a result of this suggestion, the B.S.B.I. formed in 1950 a Conservation Committee of six members with Mr. J. E. Lousley as Secretary. The Committee were to hold Liaison Meetings with the officers of the Nature Conservancy to discuss matters of mutual interest. The first of these Liaison Meetings was held in the Nature Conservancy's temporary headquarters in Victoria Street, Westminster, on 16th November 1950, and similar meetings have been held twice yearly (once only in 1961 through the illness of the Chairman)—usually in March and November—up to the present day, with the Director-General or the Deputy Director-General in the Chair. The following is a list of B.S.B.I. Members who have assisted the plant conservation movement by sparing time to sit on the Conservation Committee. Those marked with a dagger (†) have held or are holding the post of Secretary, and those with an asterisk (*) are the fifteen Members of the Committee today: The late Mr. A. H. G. Alston, Miss M. S. Campbell, Dr. D. H. Dalby†*, Mr. J. E. Dandy, Capt. C. Diver, Dr. J. G. Dony, Mr. R. S. R. Fitter*, Mr. J. S. L. Gilmour, the late Mr. R. A. Graham, Mr. R. M. Harley†*, Mr. F. N. Hepper*, Mr. A. C. Jermy*, Mr. D. H. Kent, Mr. J. E. Lousley†, Mr. E. Milne-Redhead*, Mrs. V. Paul*, Dr. C. D. Pigott†, Dr. F. Rose*, Mr. C. A. Sinker, Mr. D. Streeter*, Mr. V. S. Summerhayes*, Mr. E. L. Swann, Dr. S. M. Walters*, Mr. P. J. Wanstall*, Dr. E. F. Warburg, Mrs. B. Welch, Dr. S. R. J. Woodell*, Dr. D. P. Young*.

Members of the B.S.B.I. are probably not aware of the great amount of useful work done by these friendly constructive round-table meetings with the Nature Conservancy. In addition the Conservation Committee has done much useful work regarding reported threats to rare or local plants or to interesting habitats, particularly during the years before the Naturalists' Trust movement got under way.

In addition to those serving on the Conservation Committee, many B.S.B.I. Members have given valuable help to the Nature Conservancy in recommending areas to be notified as Sites of Special Scientific Interest and in suggesting suitable boundaries for these Scientific Sites.

The Conference on the Conservation of the British Flora, held at Durham from 18th to 20th April 1963, has demonstrated the keen interest shown by our Members and other botanists in this vital subject of Conservation. It has also shown the importance which the Nature Conservancy attaches to the opinions of members of the Society, who are ready to place their often detailed knowledge of the flora at the disposal of the Conservancy. No fewer than eleven officers of the Conservancy were present, including the Regional Officers from as far away as the North East Region of Scotland and the South West Region of England.

In the following pages will be found seven of the nine papers printed in full, one paper represented by a summary in the third person prepared by the Author, and one, which was fully illustrated by excellent colour photographs (which for financial reasons it is impossible to reproduce here), is shortly mentioned. I would like to thank the authors for so promptly sending me typescripts of their papers.

The discussions have been included as fully as possible. I would like to express my personal gratitude to Dr. M. E. Bradshaw for arranging for a recording of the discussions to be taken and to Prof. D. H. Valentine for having the recordings transcribed. There were occasions, however, when a verbatim account was lacking on the tape, and in these I have done my best to convert the *précis* provided by Dr. Bradshaw into the words which I believe the contributors used. In a few cases the sense of the *précis* was not clear enough for me to do this, and I had to ask the contributor to provide me with a copy of his remarks. I hope that the resulting account is reasonably accurate and that there are not too many omissions. I am greatly indebted to Mr. H. K. Airy Shaw for assistance in reading the proofs of this Report.

Finally, not as Editor, but as one attending the Conference, I would like to express my appreciation to Prof. Valentine, Dr. Bradshaw and all the staffs of the Durham Colleges* whose hard work and careful planning helped to make this Conference such an outstanding success.

E. MILNE-REDHEAD

* Now the University of Durham.—Ed.

INTRODUCTORY REMARKS

THE President of the Society, Mr. J. E. Lousley, opened the Conference with the following remarks:

Conservation has now been an important part of the work of the Botanical Society of the British Isles for a good many years. In 1947 it became necessary to set up a special committee* for this purpose, and this has played an active part in averting or mitigating threats to our flora, and in supporting conservation with reports on areas of botanical interest. It is surprising that we have waited until 1963 for our first conference devoted entirely to this subject.

During the past few years there has been great progress in conservation activity generally, and a rapid increase in the number of organizations concerned. This seems a most appropriate time to consider how our work fits in with that of other bodies, and how we can co-operate with them more closely and with maximum advantage. I hope that this aspect will be borne in mind throughout the conference.

It is now my pleasant duty to thank Professor Valentine and the Council of the Durham Colleges for the invitation to hold our meeting here. It is evident that everything has been done to make it an extremely comfortable and useful one.

Mr. Lousley took the Chair for the first four papers.

* Known as the Threats Committee ; it was actually set up on 29th October 1948 consisting of the Officers and Mr. A. J. Wilmott, and was replaced by the Conservation Committee in 1950.—Ed.

AFFORESTATION AND CONSERVATION IN NORTHUMBERLAND

W. A. CLARK

(King's College, Newcastle)

THE competing claims of afforestation and conservation in this country have for a long time now engaged the attention of naturalists and biologists. The late Sir Arthur Tansley in his book *Our heritage of nature* published in 1945 discusses some of the pros and cons in the conflict, as he puts it, between the national and economic demand for the production of coniferous timber and the opposing aesthetic, sentimental and scientific interests involved. His chapter on the work of the Forestry Commission I commend to all interested. In this paper my aims are threefold: (1) to give you some idea of the extent and nature of the Northumberland forests, (2) to consider the effects of afforestation on conservation, and (3) to make some suggestions and draw some conclusions in the light of our experience in Northumberland.

In Northumberland and the adjacent parts of Scotland, the largest planted forest in Britain has been gradually established during the last 40 years. This Border Forest Group comprises some 176,000 acres of land (or about 280 square miles) of which the areas under trees or to be planted account for 120,000 acres. The remaining 56,000 acres have been set aside for retention under agriculture. The forest extends from the Roman Wall in the south across the west of the county to the Cheviots in the north, embracing the valleys of the North Tyne and Rede. Thus approximately one-tenth of the total area of Northumberland has been given over to afforestation with conifers. The bulk of this has been planted with Norway spruce (*Picea abies*) and Sitka spruce (*Picea sitchensis*)—the latter being preferred because of its greater resistance to winds. Scots pine (*Pinus sylvestris*) and Lodgepole pines (*Pinus contorta* var *latifolia*) are used where heather is the dominant plant, while Japanese larch (*Larix leptolepis*) is planted in the bracken areas.

Most of the afforested land lies above the 700 ft. [210 m.] contour and is characterized by acid and gley soils derived from boulder clay deposits. The alluvial and better soils of the flats and haughs of the valley bottoms have been, in the main, reserved for agriculture. Thus the rich riverside and meadow communities have not been affected by planting. The upland area before planting supported four principal types of vegetation. On the better drained

soils some form of heather moor was to be found. *Molinia caerulea* grassland was characteristic of the damper mineral and peaty soils on gently rolling slopes with some natural drainage. The peat was generally structureless and relatively shallow. This was the most widespread vegetational type of the afforested area. On slightly drier soils, *Nardus stricta* replaced *Molinia* as the dominant. At higher levels on waterlogged soils, bog vegetation predominated. Much of this conformed to blanket bog with *Eriophorum vaginatum* as the dominant, but, in the deeper basins, deposits of peat up to and over 20 ft. [6 m.] deep occurred with a good surface cover of *Sphagnum* and associated species. Relict woodland communities constituted the last of the vegetational types of the area. In most of these, birch (*Betula*) was dominant with alder (*Alnus glutinosa*) in the wetter regions, but scraps of oak (*Quercus*) and ash (*Fraxinus*) woodland were also to be found and Edlin (1958) reports a surviving fragment of native Scots pine (*Pinus sylvestris*) forest in William's Cleugh, near Kielder. Dr. Blackburn's (1953) palynological investigations of the Border Forest peats reveal a Post-Glacial forest succession in the forest area agreeing in general with that of England as a whole but regionally different in that birch and hazel (*Corylus*) throughout the whole period were more abundant than elsewhere in England. Conversely, oak was never quite so plentiful in this upland area as in more lowland situations. The historical record shows that much of this primeval woodland survived until the beginning of the seventeenth century, although degeneration due to natural causes and to man's activities had already set in. The ultimate destruction of the native woodlands has been mainly attributed to the intensive sheep grazing which followed the establishment of more peaceful times as a result of the Union of the Crowns in 1603. This grazing has, of course, persisted until recent years. It is significant that the surviving relics of woodland nearly always occur in steep sided valleys relatively inaccessible to sheep. To the grazing was added the practice of moor burning and gradually the original woodlands were replaced by the man-made communities of heather moor and grassland. These anthropogenic changes were accompanied by the gradual run down of soil fertility, a process no doubt accelerated by the natural leaching of the soil on the removal of the forest cover. As the better grazings deteriorated so did the sheep industry, and this, aggravated by other economic factors, reached a point when many sheep farms ceased to be profitable. This then was the legacy inherited by the Forestry Commission when it started its work in the area 40 years ago. Time does not allow this morning for a consideration of the relative merits of grazing and afforestation and in any case this has

already been done by Pearsall (1950) in his book, *Mountains and moorlands*, and by others. Suffice to say that from the production point of view, there is much to be said in favour of afforestation with conifers in this area of predominantly "mor" soils and also from the point of view of maintenance and improvement of soil status. It must also be recognized that the border forests will make a considerable addition to the rural economy of the area and it has been estimated that for 100,000 acres of plantations some 2,000 workers will be required. The forest will therefore provide a livelihood for at least 6,000 people, whereas before afforestation, the hills supported only a few hundred. The case then for the establishment of the forests was a strong one which I think, as naturalists, we must accept. In any case the forests have been created and we must next consider the impact of this on conservation.

Conservation in Northumberland was first considered by a regional sub-committee of the Nature Reserves Investigation Committee with Mr. G. W. Temperley as its secretary and this sub-committee reported in 1944 and again in 1947. Five areas, all of them large, were recommended for conservation as nature reserves so as to preserve within the county, and I stress *within the county*, a representative range of natural and semi-natural habitats with the greatest possible wealth of plant and animal species. When the Nature Conservancy came into being in 1949, these sites were taken over as Sites of Special Scientific Interest—Scientific Sites (or S.S.S.I.) for short, and during the last 14 years others have been added. The present position in Northumberland is that we have one National Nature Reserve (viz. Coom Rigg Moss) and 12 Scientific Sites. Of these, four have been affected by afforestation and I would like to consider these with you, now, starting with Coom Rigg Moss which is situated at the head of the Chirdon Burn about 10 miles west of Bellingham. Amounting to 88 acres, this moss has been leased from the Forestry Commission for preservation as an example of relatively undamaged upland bog mainly ombrogenous in character. The bog possesses a good and actively growing *Sphagnum* cover with *S. papillosum* and *S. magellanicum* as its principal constituents. Indicative of relative freedom from human interference is the presence of *S. imbricatum*, *S. fuscum* and such species of flowering plants as *Andromeda polifolia*, *Carex limosa* and *Drosera anglica*. This last species is now very rare in north-east England and known from only one other locality in Northumberland to which reference will be made later. Before being taken over by the Conservancy, attempts had been made to plough the surface by the Forestry Commission but fortunately this was limited to a relatively small part of the moss. Such mosses were at one time

common in the north of England but as a consequence of man's interference are rapidly being destroyed or modified. We were fortunate in this case in ensuring the preservation of Coom Rigg Moss before further damage was done and are grateful to the Commission for making this possible. An ecological and historical investigation of the bog has been carried out by Dr. S. B. Chapman of University College, London, and now at the Furzebrook Research Station of the Nature Conservancy. He assures me, that, although the bog is surrounded on all sides by drained and planted land, it is large enough to maintain its own water supply and that there is little danger of its drying out, which would, of course, destroy its present scientific value. He does suggest, however, that in the future, as the surrounding conifers grow to seeding age, the drier regions may be threatened with natural colonization by the conifers and that management may have to be directed to prevent this. Such natural colonization with *Pinus* can be seen today on the drier middle section of Muckle Moss lying south of Housesteads on the Roman Wall.

Before leaving bog vegetation, I should like briefly to refer to another example worthy of conservation, this time situated in the Wark Forest near the Cumberland border. In many of its features it resembles Coom Rigg Moss, but *Drosera anglica* is even more abundant and here is accompanied by *Rhynchospora alba*—the Beaked Sedge—a very rare plant indeed in Northumberland and one whose distribution is mainly in the west of Britain. A considerable part of this moss has been cut off by a forestry fence and drained by deep parallel trenches, though no trees have been planted on this portion. Considering how rare such undamaged bogs are in our region, this unnecessary drainage is to be deplored. Damage such as this could easily have been obviated by prior consultation with the Nature Conservancy or with local botanists. I shall return to this question of consultation before development for afforestation later. Notwithstanding the drainage, this moss is still undoubtedly worthy of conservation.

The next two Scientific Sites affected by tree planting can be considered together, namely the Harbottle Moors in Coquetdale covering some 4 square miles, and Billsmoor and Tosson near Rothbury, amounting to 10 square miles. These Sites were intended to conserve examples of fell sandstone heather moorland, bog vegetation, and relict woodland together with associated fauna. In both Sites we have had to concede land for afforestation, mainly areas of heather moorland, but we are perhaps more concerned with the threat to the existing scraps of natural woodland, not only within these two sites, but elsewhere in the afforested areas. We

have already seen that much of this is found in steep sided sheltered valleys, sites much in demand for conifer planting. As an ecologist I should like to see all the relict woodland conserved. It is realized that such a policy would involve problems of management, of fencing to keep out sheep, and even in some cases of supplementing regeneration with planting from local strains and that all this would have to be financed from some source. Nevertheless it would seem very worthwhile. Some of these woodlands lie within planted areas and are therefore already fenced off. It would also, I am sure, be in the interests of the Commission to maintain as much ecological diversity with their forests as possible, particularly in view of the current practice of establishing cast stands of a single species of conifer. Elton (1958) in his book *The ecology of invasions* cogently argues the case for the maintenance of reservoirs of plant and animal species against the chance explosion of an invading plant or animal pathogen. I am pleased to report that liaison and co-operation have been established with forestry officers with a view to conserving where possible the natural woodlands. The tangible result of this has been an agreement to maintain, and develop if necessary, two of the oldest and best pieces of natural surviving oak woodland in the north of Northumberland. Both of these occur in the Holy-stone area of Coquetdale and historical records of one of these date back to the fourteenth century. Some of the associated birch wood has been underplanted with conifers but this will be kept to a minimum to conserve woodland of considerable ecological interest and floral diversity. A special feature of this woodland is the presence of well grown specimens of juniper (*Juniperus communis*)—the largest I have seen in north-east England. Good birch and alder woodlands also occur in the Wilkwood and Riddlees area of Coquetdale, and the Harbottle S.S.S.I. has been recently enlarged to include these. They are of special interest because of the occurrence of calcareous flushes which support a rich orchid flora, *Parnassia palustris*, *Eriophorum latifolium* and some interesting bryophytes. The Grasslees Burn in the Billsmoor and Tosson area is the site of what is probably the best piece of Alder (*Alnus glutinosa*) woodland in the county. Although at present grazed, some regeneration of alder is taking place and a special feature is the occurrence of head high stands of sweet gale (*Myrica gale*), a plant which is rare in Northumberland and with the exception of Crane Moss in the Harbottle site, mainly occurs in flushed areas. Good birch on block scree is also found in Grasslees and the bird and insect populations are worthy of note. Most of the existing woodland National Nature Reserves are situated in the south and west of Britain and out of a total acreage of 15,000, alder woodland

accounts for only 3 acres (1961, *Report of the Nature Conservancy*). A good case, I think, could be made for consideration of this valley as a possible reserve for alder and birch woodland and, if created, this would help to redress the balance in the distribution of woodland reserves.

The last example I want to mention is the Allenbanks, Staward S.S.S.I., situated in south Northumberland. This includes the steep sides of the River Allen and its tributaries between Staward station and Plankey Mill where the site adjoins the "Allen Banks" Estate owned by the National Trust. This is again a woodland site providing one of the best examples of mixed deciduous woodland in the county. The woodlands are characterized by sub-alpine associations in which birch, oak and ash on the higher levels yield to wych elm (*Ulmus glabra*) lower down, and along the streams and in wet areas to alder. Special populations of insects, only paralleled in Ireland, and in Scotland in Argyll and Perthshire, are found associated with the various trees. Furthermore the alders carry the only known station in Northumberland for the Sprawler Moth (*Brachyonicha sphinx*). The area also contains the standard geological section of the Upper Limestone Group (Carboniferous). Before the founding of the Nature Conservancy, parts of this woodland had been planted with conifers some of which were felled during the last war. Since, however, it became a S.S.S.I., additional areas of the woodland have been taken over by the Forestry Commission. Thinning of the native deciduous trees has taken place and conifers planted in their place. A few years ago the whole of the south bank of the Kingswood Burn was treated in this way and planted with Douglas fir (*Pseudotsuga menziesii*), Hemlock spruce (*Tsuga* sp.), Arbor-vitae (*Thuia* sp.) and some beech (*Fagus sylvestris*) at the higher levels. This, to me, would seem to be a bad example of upland land utilization leading in all probability to a reduction in site fertility. It would seem essential that if this habitat is to be preserved, no further inroads should be made for coniferous planting.

So much then for afforestation and conservation in practice in Northumberland. It remains now to draw up a balance sheet and to attempt to formulate some conclusions. There have been losses but not to the extent that one might have imagined from the vast scale of the planting operations. What emerges clearly is that, in general, the officers of the Forestry Commission are sympathetic to conservation within the limits of their main directive to plant trees; also that the establishment of personal contact with officers has led to beneficial results and to the appreciation of the other point of view. Changes in personnel do, however, take

place, liaison may be broken, and sometimes development, as we have seen, may take place on a site without the realization of its importance to biologists. Developments within Scientific Sites and within the Northumberland National Park are of course referred to the appropriate bodies, but I suggest that, as an additional safeguard, proposed changes in land use should also be referred to the local Naturalists' Trust, if such exists, and in our area to the newly formed Northumberland and Durham Naturalists' Trust. Sufficient notification to allow time for inspection of proposed areas for development should also be given. In this way habitats of special interest could be brought to the attention of foresters and other developers before damage is done.

On the credit side of the balance sheet should be put the creation in 1955 of the Border Forest Park, for this has opened up a large tract of forest for the recreation, enjoyment, and education of the public. At Lewisburn, a camp with facilities for campers and caravanners has been built. Access to the forest, compatible only with the proper protection and management of plantations, is now available to all, and there is no reason why naturalists should not avail themselves of the opportunities offered. The developing forests are of considerable interest to ecologists and naturalists. There is already some evidence that the forests may actually favour some species such as *Trientalis europaea* and *Goodyera repens*.

The great weakness, in my view, revealed by this study is the unsatisfactory position of Scientific Sites in a country where increasing demands are being made for land for agriculture, forestry and other development. The only certain method of conservation is the acquisition of habitats specially for the purpose and their subsequent management, if necessary, for the maintenance of the special features for which they have been selected. In a recent paper, Moore (1962) discusses this point in relation to the survival of the famous Dorset heaths. For such acquisitions, money is required and should be made available to the Nature Conservancy not only for the creation of a few large nature reserves—valuable as these are—but also for the preservation in the various regions of a representative set of habitats. It is also very much to be hoped that the new Naturalists' Trust, as support increases and funds accumulate, may play an increasing part in what might be described as the more local aspects of conservation. Dr. Bradshaw may have more to say about this on Saturday morning*. Only in this way can habitats be ensured for the enjoyment of naturalists and for the research and experimentation of the scientist.

My main thesis, then, is that in the interests of all a balance

* See pp. 56–60.

must be maintained in each region between the competing claims of economic development on the one hand and the conservation of our wild life on the other. I trust this is not a pious hope.

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DISCUSSION

Mr. LOUSLEY (Chairman): The Forestry Commission in many parts of the country is extremely co-operative in matters of conservation when small areas are involved, but when conservation affected a large district, the Commission had to conform to their terms of reference.

An important aspect of conservation mentioned by Dr. Clarke, which should be discussed during this Conference, is the unsatisfactory status of the S.S.S.I., for experience has shown us the extremely limited value of the present arrangement.

Dr. ASHBY: I've seen, in Dasmann's book on conservation,* that the idea of monoculture had been taken over by the Forestry Commission from Germany where it has now been abandoned as being uneconomical in the long run, for you get less timber off the land if you have monoculture.

Dr. CLARK: I think some of the Forestry Commission folk would like eventually to get over to a system of uneven age forests; their primary consideration was simply to plant trees and the easiest way to do this was bulk planting. Eventually, I think, some are wanting to get over to forest which will be self-containing and self-regenerating.

Mr. LOUSLEY: You'll find the Commission's policy has changed fundamentally in the last few years. They planted conifers largely because they were charged with building up a strategic war reserve of timber which experience in the last war showed was not entirely what the government required. Now, they are going over much more to planting deciduous trees which will conform to the new policy; they are also planting belts of deciduous trees around conifers. Monoculture is not stressed to the same extent.

Mr. WILKS: Does this planting of 10 per cent of the County with forest have any effects on the rest of the area and if so what are they?

Dr. CLARK: I have no evidence that the flora of adjoining areas has been much influenced, though obviously the large scale ploughing is bound

* *Environmental conservation* by R. F. Dasmann. London: Chapman & Hall, 1959. Price 52s.

to influence the hydrology of the overall area. This does result in water running off much more quickly, and will influence riverside plants. I am not competent to speak of the fauna but I can conceive that the insect and bird populations will have been affected to a much larger extent.

Mr. HEMSLEY: Dr. Clark's stimulating paper raises many points. It is of interest to state that the Nature Conservancy are aware of the valuable field of liaison between our sister body, the Forestry Commission and ourselves. The Conservancy have recently set up a joint management liaison committee with the Commission on an England, Scotland and Wales basis. Dr. Eggeling and the Master of Arbuthnott are the Scottish representatives and Mr. A. E. Boote, Mr. H. B. Fawcett and myself are those for England and Wales. We are hoping to look into these problems of general application and to try and clear up some of the troublesome administration points which often have similarity from region to region, but owing to certain causes all the regions may not be at the same stage of development in these matters. In the South West Region in Dartmoor and Exmoor we have run into many of these causes at an early stage. Afforestation in this country is at a very early (40 year) stage, whilst in Belgium it is at the 80 year stage. There problems are entirely different; the movement from this monoculture must be regarded in the light of a much greater time factor and, as we move from this thicket stage, there is much greater scope, once the canopies are established, for the mixed age, diversification and mosaics approach. Of course, the techniques of mosaic management are vastly different and if one is going to work amongst standing crops the programme must be very, very clearly worked out. This is for future consideration and several decades ahead we shall look back on our present thoughts with some amusement and see the thing in its proper perspective.

CONSERVATION AND LAND USE

with special reference to Moor House National
Nature Reserve, Westmorland

A. EDDY

(British Museum (Natural History))

THE changes produced in our natural flora and fauna due to human activities have long provided material for discussion. That man's influence has been profound and widespread is beyond any doubt. A whole range of such effects are in evidence, often subtle to detect, sometimes immediate and catastrophic, and they may be produced directly or indirectly. Floras are altered in character and distribution, many species rendered extinct, while other alien species are introduced. The changing flora following the almost complete eradication of forest land gives an outstanding example, for what greater difference could there be than that between the mixed forests of the past and the semi-natural and agricultural grasslands of the present? Then there are the thousands of acres of *Eriophorum* moors of the southern Pennines, which supported heather and *Sphagnum* in the past. One could go on indefinitely giving such examples as these. Apart from a few small areas, as in the more remote Scottish hills, and on inaccessible cliff-ledges, I think it is true to say that none of our flora has escaped anthropogenic pressure of one form or another.

Individuals among the higher animals are often able, in time, to adapt their behaviour patterns to fit in with the changing environment or, now that the idea of conservation has become more widely accepted, establish themselves in some of our Nature Reserves, for example. Even so, human interference usually results in some disturbance of the complex community systems, often with disastrous results, and not always readily detectable in the early stages. Plant life, because of its sedentary nature, relies entirely upon transportable propagules, i.e. seeds, spores, etc., for its migration and establishment. If, due to induced environmental changes, the production of these propagules is prevented, or if those that are produced are subsequently prevented at some stage from developing into mature plants, then anthropogenic influence will give rise to irreversible changes in vegetation.

Before going further, I wish to make it clear that I do not intend to go into detail with regard to rare plants alone. After all, rarity in a species is relative, and the common plants, which regrettably

are often ignored, are the more important to the ecologist because of their constancy. A study of the less common species for their own sake, without due regard to their ecology and associated plants, can show little profit. On the other hand, rarity of a species may be due to a variety of causes: climatic shifts may restrict erstwhile common and widespread species to a few relict outposts, as in the case of a large proportion of the notable Teesdale plants; gross reduction of populations may be caused by collectors, or habitats may be destroyed by some human agency; in some cases a plant may be rare simply because it is so particular in requirements of soil, or so sensitive to environmental fluctuations, that only a few places exist where it is able to survive. Some of the serpentine plants belong to this type.

Wherever an old habitat is destroyed, or in some way altered, a new one is invariably produced, which, in time, will come to support some sort of plant and animal life. Too often such habitats are scorned as artificial, and in consequence as not worthy of the attention of the field botanist. There is such a fine gradation between the obviously man-made habitat and the strictly natural one, that to draw a dividing line would sometimes be very difficult if indeed possible.

In such a short space of time it is not feasible to attempt to summarize the infinite number of ways in which the hand of man has played a part in the modification of the British flora. In this short discourse I shall merely attempt to demonstrate some of the more obvious effects of land use on the vegetation and flora of a limited area of upland country in the Northern Pennines, i.e. the Moor House National Nature Reserve.

The Moor House National Nature Reserve came into being in 1951, incorporating some 10,000 acres of upland country, representing a fair section across the summit ridge of the N. Pennines from approximately 1650 ft. [495 m.] in the SE., rising gently then more steeply to over 2700 ft. [810 m.] on the "fells" to fall sharply to just under 1100 ft. [330 m.] on the western escarpment. The Reserve is bounded on the north by Crowdundle Beck and the headwaters of the River Tees, and on the south by Mattergill Sike, Knock Ridge, and Swindale Beck.

Apart from a small exposure of Ordovician rocks (Skiddaw Slate Series) at the foot of the western escarpment, the solid geology is wholly represented by the Carboniferous Formation of limestones, sandstones and shales, with the intruded Great Whin Sill (Dolerite) outcropping in and by the R. Tees down most of the eastern boundary, and again in the steep becks of the western side.

Glacial and periglacial deposits of boulder clay more or less

completely cover and obscure the solid geology of the eastern side of the Reserve up to about 2000 ft. [600 m.]. On the western side such deposits are more or less confined to the base of the escarpment, with pockets in some of the stream valleys up to 2200 ft. [660 m.]. Early post-glacial solifluction deposits are widespread throughout the Reserve, composed of heavy grey clays generally poor in bases, and more or less impermeable.

These original soil types and glacial deposits, under the influence of a wet climate, came to support extensive formations of thick blanket peat, except on the steeper slopes and the exposed and well-drained tops of the higher fells. Elsewhere the dominant soils are acid peaty gleys and podsol, with here and there small patches of base-rich soils over limestone and in flushes. Naturally the more precipitous slopes of the western escarpment precluded the development of deep peat, except on the flatter shelves, and soils and flora here tend to show a much closer relationship with the underlying rock formations, and are therefore very varied.

The deep peat probably developed under somewhat wetter conditions than at present. The climate of the northern Pennines may now be considered to have fairly pronounced Atlantic tendencies, with arctic conditions imposed by altitude and exposure. Seasonal fluctuations of temperature and rainfall will be greater than in the past, with more pronounced dry periods, and more severe winter frosts. In considering present-day vegetation, care must be taken not to confuse climatic influence with anthropogenically caused vegetation changes. Climate may have strong modifying influence upon the manner in which plant communities react to human interference, as will be shown below.

The carboniferous strata in this area are among the most richly mineralized of any in the Pennines. Maps are available which show a wide system of veins at different levels in the Lower and Middle Limestone groups.

The existence of minerals in the northern Pennines had been known from fairly ancient times and it is coincidental that Hadrian's Wall almost exactly marks the northern limit of the Pennine ore-fields. However, it is doubtful whether more than a few of these deposits were in fact mined in Roman times and it has furthermore been suggested that there would be little prospecting until long after Roman times, that is, until there was some settled population on Alston Moor. At any rate we can consider that disturbance through human activity on the higher moors would be negligible before the tenth or eleventh century. Some of the earlier known workings in the dales date back to the twelfth century, and by the sixteenth century nearly all of the Weardale deposits were being mined. The

actual peak of mining activity seems to have been reached in the eighteenth century and maintained for a considerable period, and it would be at about this time that the deposits in these more remote and somewhat inaccessible regions began to be worked. Transport was mainly by pack-horse for which crude roads were constructed, several of which can be traced at the present time, such as the one running to Dun Fell Mine, along Troutbeck.

The effects upon the flora of the Reserve due to mining activities are more or less local in extent, but the number of such scattered localities is quite large.

In the first instance can be considered how water relationships might possibly be affected by the underground activities of miners.

Although the climate is wet enough to support vegetation of some kind, the water table of the soil largely determines the species-composition of the plant communities developed. The stratified rock formations (especially the somewhat soluble limestones), and varying nature of dip and topography, have caused the formation of complex surface and subsurface drainage systems. Sinkholes and springs are common, especially at higher levels, and are characteristic elements of the scenery. Surface and underground water courses may be disturbed by natural phenomena such as the collapse of underground caverns, but they are just as readily caused by the various tunnellings of the old adit levels and air shafts of the early miners. Fortunately few of these activities on the Reserve have been at a high enough altitude to affect the more interesting and uncommon floras. The main spring and flush systems are above 2250 ft. [675 m.], that is, well above the mineral-rich strata, and have been left largely undisturbed. The plant communities of these springs are complex and of great interest to the botanist, particularly the ecologist, and a little more will be said later concerning them.

Water provided a valuable source of power, and was brought into the service of the miners in connection with "hushing" and washing processes. Hushing involved the damming of natural or artificial water courses, these being subsequently breached to let the full force of water rush straight down hill. Surface soils and drift and the lighter unwanted deposits were carried away in this manner, leaving the heavier lead-carrying rocks behind, or exposing the bedrock for prospecting.

Where no convenient streams were available, long channels were cut, mainly through peat, to drain and lead water to a hushing dam (e.g. the channels on the eastern slopes of Little Dun Fell, in connection with the hush at Swathbeck Mine) or in some cases to the main workings (e.g. the channels running along the flanks of

Cottage Hill, to the extensive workings at the foot of Troutbeck). In acid and base-poor situations, such channels take many years to become recolonized, and many are still plainly visible after a very long period of time. Eventually they may become overgrown and indistinguishable from the original state, but some effects of draining are still plainly visible at the present time, after the lapse of well over a century. In this connection it is interesting to compare the flora above and below the Cottage Hill channel, where the draining effect on the peat has greatly reduced *Sphagnum* cover above the channel, while below it the bog surface is healthy and still active.

The hushes themselves vary enormously in size from quite small, narrow channels to deep, wide gashes in the hillsides. Some were formed mainly by water, as already described; others, such as the huge Dun Fell Hush, are more akin to large trenches, or small open-casts. In some cases a hush may cut across and capture existing streams.

The effect of these methods on the flora depends largely on situation. Where the gullies cut through peat, the water-retaining properties of the latter, under the influence of a wet climate, may prevent any rapid and noticeable change in vegetation for some considerable time, but oxidation and drying out eventually favour such plants as *Vaccinium*, *Empetrum* and lichens, a comparable situation to that found around the very extensive peat-erosion systems. Finally, peat erosion may be initiated, or at least accelerated. Over other types of ground the changes produced in surrounding vegetation may be obscure or pronounced. *Juncus effusus* or *Eriophorum vaginatum* may be eliminated in favour of *Juncus squarrosus*, *Nardus*, etc., or in some cases a *Festuca-Agrostis* sward may even develop.

The various mineral veins are associated with different strata which may be sandstone, whin or most frequently limestone. The relative proportions of the component mineral compounds varies at different levels, and some which are abundant at one level may be rare or absent at another. For example the abundance of fluorspar and scarcity of barytes around Moor House contrasts strongly with the barytes-rich veins at higher levels, such as at Dun Fell, where the fluorspar is rare.

It follows that the various spoil-heaps around the mine entrances also vary in composition, both in the quantity and composition of mineral ores. Some, in fact, contain little in the way of contaminants, being more or less unaltered limestones or sandstones, while the rocks in others have been so altered that it is sometimes difficult to recognize their original nature. The latter contain a great variety of minerals, including compounds of lead, zinc, copper, etc., and

so tend to be rendered highly toxic to plant life due to the concentrations of salts of heavy metals to which they give rise. Some heaps of more or less pure limestone are completely overgrown with a rich grassland identical in species composition to that of the native limestone outcrops, and even the coarser types support typical limestone scree vegetation. One such, in a tributary of Force Burn, now supports a thriving colony of *Polystichum lonchitis*. The barium-iron-lead spoils of Dun Fell and elsewhere, on the other hand, barely support any kind of plant life over considerable areas, simply because of their high toxicity, despite the heavy rainfall and small particle size.

By way of compensation, there are a number of plant species which seem not only to survive, but to show preference for some of the old lead mines, though they are by no means restricted to them. Notable among these are *Thlaspi alpestre* and *Minuartia verna*. It is likely that many of these plants would be far less common had these extra habitats not been so fortuitously provided. Again it is interesting to note that, in what has been a comparatively short period of time from an evolutionary point of view, resistant strains or varieties of several plant species have been developed. Such varieties have been proven among such grasses as *Agrostis tenuis* and *Festuca ovina*, and I suspect some resistant strains of *Thymus drucei* and other herbs could be shown to exist.

The succession of plants on screes is complex, and varies greatly according to situation, coarseness of particles and so on. The number of years involved in succession of scree vegetation prohibits convenient study, except from a theoretical standpoint, by a single observer. Accurate assessment of rates of colonization and succession is also more or less impossible for those screes which have attained some degree of stability, as is the case with most of our natural upland screes in this area. In the tips thrown up during mining activities, we have been left with a legacy of a large number and variety of artificial screes, whose age can in many cases be determined simply by reference to old mining records. Up to a point, comparative work on these and natural screes may lead to valuable conclusions concerning the ecology of the latter. Some of the calcareous spoils have been thrown up in the wet, acid peaty areas, to which they have supplied various bases, tending to produce the anomalous succession of bog to fen!

From about the fourteenth or fifteenth century, with the growth of the woollen industry in northern England, sheep-grazing has been a major factor in the modification of upland vegetation. Of course, a certain amount of grazing would always be present, but the density of man-maintained flocks of sheep must be enormous

in comparison with such wild grazing animals as existed here before. At the lower levels, i.e. below about 1900 ft. [570 m.] and especially on the lower slopes of the western escarpment, rabbits would have played an important but secondary rôle in the overall biotic pressure. It is impossible to ascertain the magnitude of rabbit grazing, due to the unrestricted grazing of domestic animals, which masks its effect. Rabbits are at present fairly scarce on the Reserve, and it will be interesting to see whether they will build up in future, and what effects they may produce. Voles are numerous at least below 2000 ft. [600 m.]. The population fluctuates rather widely, and again it is difficult to estimate what fraction of the overall biotic pressure can be attributed to voles.

It is possible that many of the limestone exposures, and perhaps some of the alluvial terraces, may have supported some form of scrub vegetation, with juniper (*Juniperus communis*) and dwarf willows (*Salix* spp.) for example. Specimens of juniper and rowan (*Sorbus aucuparia*) persist below 2000 ft. [600 m.] even on exposed situations, and seedlings of the latter are frequent, except where accessible to sheep. It is probable, then, that although exposure may account for the absence of shrubs on the exposed limestone soils at higher altitudes, this cannot represent the only limiting factor in sheltered areas. This is indicated by the presence in a sinkhole of a flourishing specimen of *Salix aurita*, and this at over 2500 ft. [750 m.] on the summit of Knock Ridge!

Sheep are highly selective creatures when given the opportunity, and always tend to congregate about the richer grasslands and herb-rich communities of base-rich habitats, limestones, alluvial flats and flushes. In such areas the herbage is cropped close to the ground throughout the season, and tall-growing herbs and tree seedlings just do not stand a chance of growing more than a cm. or so above soil-level. Seed production is greatly reduced, so that high grazing pressure favours perennial plants of low stature, rosette plants and species which are capable of vegetative reproduction. Annuals and biennials are absent with a few exceptions. *Linum catharticum* and *Euphrasia* spp. are very small annuals which can flower and produce seeds in a very short season. I have seen specimens of *Linum* only 1–2 cm. high, yet with mature capsules. Apart from sheep-resistant biennials such as *Cirsium palustre*, the only successful biennial is *Gentianella*, which, like *Euphrasia*, is very small.

Now while sheep may not be the controlling factor in the limiting of the number of non-perennial plants, it seems that they may on the other hand, in keeping the habitat open, be largely responsible for their presence in such quantity. What would happen if the

grazing factor were to be removed? It has been stated that sheep represent a major leaching factor of soils, and this is undoubtedly true on a wide scale. At this altitude, with high annual rainfall and rather low mean temperatures, breakdown of organic plant remains will be slow compared with lower altitudes. Is it not possible that the net result of the suppression of grazing under these conditions, would be an accumulation of litter which would soon become acid and leached? In fact a run down of base status at least in the surface horizons of the soil might be expected. By preventing such accumulations, are sheep maintaining limestone soils in a permanently skeletal state, i.e. preserving the base-status of the surface soil and so preserving a varied flora? Such species as *Gentiana verna* would, I am sure, be much more strictly limited to the open habitats of the sugar limestones etc., if the competition of other species and grasses were not so checked.

On the other hand it cannot be denied that over-grazing may exercise a selective influence in another direction by laying a given plant community open to invasion by intrusive resistant plants, such as *Nardus* and *Juncus squarrosus*.

The calcareous springs and flushes are remarkable for the abundance of species found within their usually small and well-defined areas. Broadly speaking, two types of flush can be distinguished according to whether their species-composition depends upon continuous high water table, or upon intense grazing.

Disturbance by sheep on the first type is usually detrimental, not because of grazing intensity so much as of mechanical disturbance. The undisturbed vegetation of a spring tends to take the form of a floating mat of intricately intergrown stems and roots of *Agrostis canina*, with *Montia*, *Chrysosplenium*, and various other herbs and bryophytes. Natural bursts of these spring-heads are common, and often catastrophic on a minor scale, but sheep-treading aggravates the tendency.

The sheep-maintained flush vegetation is confined to areas of high calcium content where water supply is slow, and rarely quite level with the surface skin of vegetation (though never far below it). Bryophytes of the "Brown Moss" type such as *Cratoneuron* are dominant, forming more or less complete, unbroken carpets in which various herbs (including *Saxifraga hirculus*), grasses and sedges grow. When the grazing factor is removed, sedges grow at the expense of most other plants and in a very few years one is left with a rather uninteresting sedge sward, with few other plants able to compete. Presumably the natural climax vegetation of these high level flushes is a sedge-dominated fen with *Carex nigra* although possibly some dwarf willows might make their appearance.

A given plant community, or species, is able to survive over a range of environmental conditions which may be wide or narrow. The changes in one environmental factor may be slight, or pronounced. Again, change in any one of these factors may produce widely different effects on a given vegetation type, at either extreme of its range, in terms of another, separate factor.

Moor-burning has been practised for a long period, both to improve the grazing for sheep, and as part of the programme of management of grouse-moor. In either case, the object is the increased production of young heather shoots. However, at different altitudes, under various climatic régimes, the immediate effects of burning are diverse; in some cases it is even doubtful whether moor-burning has the desired effect at all, and may even be detrimental. For example, at 1000 ft. [300 m.] burning of mixed-moor vegetation tends to produce closed communities of heather, and *Sphagnum* is replaced by a ground flora of other mosses. At about 1750 ft. [525 m.] there seems to be a general recovery of the mixed moor, with initial dominance of *Eriophorum vaginatum* in some cases, and increased abundance of *Empetrum nigrum*. At 2000 ft. [600 m.] and over, recovery of heather is slow in comparison with that of *Eriophorum*, and in fact there may, at higher altitudes, be an irreversible swing to *Eriophorum*-moor.

It becomes obvious that no generalizations can be made concerning the effects of land use in Britain. I have tried to show how diverse these effects can be, even on such a relatively small area of what must seem at first glance, compared to much of the country, to be somewhat remote and comparatively untouched land. Obviously in order to apply any programme of conservation to any species, or plant community, an intimate knowledge of its requirements is necessary. Too much zeal and too little understanding is more likely to hasten the extinction of a plant, than to preserve it. Again, the flora of a region is not static, and "progresses" with changing conditions; it is just as essential to conserve the newer elements in our flora, as the old, whether the major factor causing change be anthropogenic or not.

Finally I wish to acknowledge my gratitude to the Nature Conservancy, for providing the facilities for my work on the Reserve, and to Professor D. H. Valentine for his invaluable supervision during my period of study.

Following Mr. Eddy's paper, Mr. GRANT ROGER, the Nature Conservancy's Regional Officer for the North East Region of Scotland, gave a talk entitled "Progress in conserving the Scottish Flora". He took the Conference on a tour of many of the National Nature Reserves in Scotland and showed, with exquisite colour transparencies, the wide range of

habitats that are being conserved, from coastal sand-dunes to mountain tops, and some of the rare and interesting plants found in them. It was, indeed, an eye-opener for some of us from the south who are not very familiar with Scotland and its flora. The discussion on these two contributions was held over till after Mrs. Gibby had read her paper.

THE WORK OF THE NORTHERN NATURALISTS' UNION

A. N. GIBBY

(Northern Naturalists' Union)

THE Northern Naturalists' Union, founded in 1924, consists of a number of local Field Clubs and Natural History Societies, including those from about 14 schools in the area. The total membership is round about 800, some 100 of these being full members and the rest associate members of affiliated societies.

Five Field Meetings are held each year, two of these being specially for junior members, one to the coast and the other inland.

The senior members, especially the leaders of field meetings and experts in various branches of biology, endeavour constantly to spread the knowledge of our local flora and fauna, particularly among the younger ones, and to create, by their example, the right kind of interest in our heritage of local treasures and to encourage the best way of examining, studying and appreciating plants, without pulling them up or uprooting them.

Much of our effort is directed towards discouraging the gathering of large bunches of flowers, orchids for example, and trying to impose a complete ban on the collecting of any plant that is decreasing or barely holding its own and, most especially, of any rarity.

Many local teachers of biology are keen N.N.U. members, who use their influence and example to prevent damage and loss and to instil in their pupils a respect for plants growing in the wild. But, in the past, some teachers have undoubtedly been responsible for enormous numbers of specimens being presented every year by candidates taking biology examinations in the G.C.E. The idea among the latter that the rarer the plants submitted the greater will be the value of the collection dies hard. On many occasions appeals in the *Vasculum*, our quarterly publication, have been made to teachers to discourage this large-scale collecting, especially in view of the fact that because of it *Gentiana verna*, *Primula farinosa*, *Lathraea squamaria*, *Orchis morio*, *Orchis mascula* etc. have shown signs of rapid decadence.

The *Vasculum* is sent out, not only to N.N.U. members, but to a number of other subscribers, many of these being individuals and libraries at a distance (some in the U.S.A.), so that our appeals for plant protection and for guarding them against destruction are spread over a much wider area than our own immediate counties.

On a number of occasions at field meetings, a leader, or other member, who has known of the existence of a rare plant has refrained from drawing attention to it and has made a point of not going to examine it himself, so as not to endanger it. This is particularly necessary when, on an exceptionally fine day, we have an attendance of well over 100. On one outing, when nearly 200 were present, no mention was made of some plants of unusual interest which several of us saw.

Again, in articles in the *Vasculum*, members are asked to be on the lookout for such things as the spraying of grass verges, the cleaning up and scraping of old walls, for example of abbey ruins, and to do all they can to find out when and where it is proposed to carry out these operations and so help in the conservation of interesting plants.

So much harm may be done through ignorance. To give one small example. Several times I have written to the Banks Committee, set up by the Dean and Chapter to beautify the surroundings of the Cathedral, which it does most admirably, concerning a large clump of *Geranium phaeum*, which had been there for many years. Workmen planting *Berberis* bushes just behind it, trampled over the greater part and then in the final tidying up swept away the trampled portion leaving only a relatively small patch, which is, happily, still there. No one concerned realized that that patch of greenery was anything but a few ordinary weeds.

Much wanton destruction by vandals of young trees in plantations, of deliberate firing of vegetation on the cliff tops, as at Blackhall Rocks, and inland, as at Waldrige Fell (from where *Pinguicula* has now disappeared) and the vegetation of pit-heaps, which had become naturally covered with birch (*Betula*), hawthorn (*Crataegus*), wild rose, elder (*Sambucus*) etc., has been brought to the notice of members.

In 1956, when there was a proposal to construct a reservoir in Upper Teesdale, the position was very carefully considered by the Council to safeguard the special plants. Fortunately, the plan was dropped* and there was no need for any action on our part.

The condition of the coast near Crimdon and Blackhall has been described as appalling, on account of the litter left by holiday-makers, chiefly from nearby Crimdon Dene which has been "developed" as a Lido etc. The consequent heavy trampling down of plants has resulted in the total loss of *Allium scorodoprasum* and *Lithospermum officinale*.

Castle Eden Dene, on the other hand, has been put into and kept

* The B.S.B.I. Conservation Committee played an active part in preventing that project taking place.—Ed.

in good condition by the Peterlee Corporation, who consulted one of our Officers about the kind of plants which would be most suitable in those surroundings and, when there was danger of landslips, took his advice on the choice of *Salix* species to plant.

From time to time, requests have been received from people asking to be shown localities for several rare plants. At one time such requests were often quite favourably received, but the direct result of granting one of these was that the royal fern (*Osmunda regalis*) was lost in the Derwent Valley. Nowadays, these requests are seldom granted, and this has led to a certain amount of resentment, but botanists in this part of the country have never quite forgotten the extermination of *Cypripedium calceolus*.

In the future we shall continue trying to stop hooliganism, resulting in wanton destruction or damage, such as the deliberate firing of vegetation, and also to cope with the litter menace. There has been a suggestion that a committee be appointed, with representatives from each of the affiliated societies, to report to the Union about threatened areas important from the standpoint of their floras or faunas and the Council to take action by every means in its power to counter all types of destruction.

This is often a losing battle, as in the case of Billingham Marshes, the last remaining bit of fenland in the North, which was destroyed by having a concrete runway built over one part for access to use the area as a corporation rubbish dump.

In 1961, our attention was drawn to vandalism in Upper Wear-dale. Plants of *Lathraea squamaria* in two stations and *Platanthera chlorantha* and *Pl. bifolia*, growing together in another had been pulled up and grouped together and the surrounding vegetation scraped away to make a "picture" for some photographers, who evidently thought that by so doing they were improving on nature. Many flash-light bulbs were scattered about. Shortly afterwards it was found that the *Lathraea* had been completely wiped out and the orchids had been considerably reduced in numbers.

These are the kind of thing about which we are greatly concerned and regarding which we must be on the alert. Some of us will continue to keep certain plants, either individuals or interesting assemblages, under observation, trying to safeguard their existence and, in particular, trying to foresee any threat to them. For example, some tree-felling in an interesting bit of woodland, resulting in the loss of many plants, occurred fairly recently not very far from this Department.

Much of what has been said seems to be of a negative nature; we don't do this and we refrain from doing something else, but the results, I am sure, are of positive value.

The unfortunate occurrences of the past, which we have been unable to prevent because we knew nothing of them until it was too late, must serve as a grave warning to us in the future to be extremely vigilant. We intend to do everything we possibly can to conserve what has been left to us.

DISCUSSION

(Mr. Lousley in the Chair)

Prof. VALENTINE: Mr. Eddy suggested that some of the plants, such as spring sandwort (*Minuartia verna*) which now occur on spoil-heaps may now be much more widespread than they used to be. Could Mr. Eddy say if these plants, which favour lead-rich soils, can be found in natural habitats or whether they can be found only in artificial habitats?

[No answer, as Mr. Eddy had left the Conference!]

Miss ROB: *Minuartia verna* occurs quite frequently as a wash-down on the banks of the Swale and the Ure, a long way from the lead mines.

Mr. GILBERT: Alpine pennycress (*Thlaspi alpestre*) occurs on the banks of the Tyne as a wash-down plant. *Minuartia verna* is quite common on the mountain limestone cliffs near Malham, West Yorkshire, where there is no trace of lead.

Mr. GRANT ROGER: *Thlaspi alpestre*, in Caenlochan National Nature Reserve, maintains itself at 3000 ft. [900 m.] and flowers well.

Mrs. RUSSELL: *Minuartia verna*, a different variety, flourishes on the serpentine in Cornwall.

Prof. VALENTINE: In clarification of my question, I would like to know if there were any plants, possibly of rather restricted distribution, which had been able to spread because of the opening up of new artificial habitats.

Dr. BRADSHAW: Sea plantain (*Plantago maritima*) has been able to spread along the western escarpment of the magnesian limestone in Co. Durham in the quarries.

Mrs. BRIGGS, directing her question to Mrs. Gibby: Has there been any suggestion of following the continental system of laws against the picking of wild flowers or is the law in this country only against the digging up of wild flowers?

Miss ROB: A bye-law against picking flowers is working very well in the case of the Farndale daffodils (*Narcissus pseudonarcissus*) but is rather difficult to enforce. Daffodils have a short flowering period and there is a big gang of voluntary wardens on duty throughout the flowering period.

Mrs. BRIGGS: I realize such a bye-law would be difficult to enforce but I hoped it would give people a guilty conscience and make them think about the damage they are doing.

Mr. WILKS: I have fought for years against the digging up and picking of wild flowers. One method I have found to be extraordinarily effective, a method anyone can adopt provided he or she has a little moral courage. Kent has a rich flora of orchids and every year in my home town it is common practice for the local florists to offer for sale bunches of orchids, lady (*Orchis purpurea*), early purple (*O. mascula*) and spider (*Ophrys sphegodes*) at

2s. 6d. a bunch, the price varying on the rarity of the orchids. After seeing a particularly bad example of this a few years ago, I wrote a violent letter to the local paper; it was written in the heat of the moment, and I really hit out with a sledge-hammer; I referred to the equivalent of Judas money, buying the heritage of the county for a couple of bawbees; those who sold these bunches were helping to denude the downs and the woods of orchids and I cried "shame!" in a most powerful voice. The next week I got five letters of reply, all supporting me. I have never since seen an orchid on sale in shops in that town. It works, but you have to write hitting people with a sledge-hammer and hitting hard. If every member of this Society wrote to their paper calling attention to every example, the culminative effect would be far greater than any number of conferences.

Miss ROB: Well, Sir, I'm quite sure you would not get anyone to buy wild flowers in Yorkshire. [Laughter.]

Mr. TORRANCE: I would like to confirm what Mr. Wilks has said. I have made myself most unpopular by finding primrose (*Primula vulgaris*) roots for sale in markets, but I went behind the scenes to find out where they came from. In the Bull Ring in Birmingham, wild primrose roots had been imported from Devon and Cornwall and the people in Birmingham were buying them for over 1s. each. Another case was the exposure of fern roots in a shop in the Strand. They had been dug up in Surrey from the Commons; a man coming out of the shop had bought some to plant in a wild bit of ground which he had bought near his house at Cobham in Surrey! I have come reluctantly to the conclusion that we are going to have some form of compulsion before we can succeed.

Miss ROB: There is one great danger in writing to the press. You must not put up the backs of those who are working on and getting their living from the land; we must not antagonize them.

Mr. WILKS: The Kent Naturalists' Trust includes 1,200 full members and nearly every major landowner in the county. The big landowners are our biggest supporters; they are trying to do the same thing as we are.

CONSERVATION IN SOUTH AND SOUTH-WEST ENGLAND*

J. H. HEMSLEY

(Furzebrook Research Station)

THE Regional Officer (S.W.) Nature Conservancy, Mr. J. H. Hemsley, provided a short account of conservation activity in the South West and South Regions of the Nature Conservancy.

A brief introduction to the two regions, which involve 11 counties, drew attention to the diversity of environment in the area, including a wide range of underlying rock and varied topography. The regions traversed an important climatic gradient, with South Dorset possibly in a critical zone between western and the drier eastern rainfall divisions. The high ratio of length of coastline to land surface was another feature of biological importance.

An account of the growth and trends of the national conservation service divided progress into two main groups. (*a*) The direct participation of the Conservancy in management of reserves. The establishment of a field force of warden naturalists and wardens had been a feature of recent years, and was playing an increasing rôle in conservation teaching. (*b*) The indirect rôle of the Conservation Officer is as a synthesizer. In this the full effects of the many competing interests of mankind were increasingly recognized. The compromise solution, with its attendant demands upon consultative and advisory services, was possibly one of the very few means available of handling the complex situation of Southern Britain.

As an illustration of conservation in practice, a short series of examples of recent operations were selected. These were:

(1) Dartmoor, where the traditional pattern of broad-leaf woodlands and their management was changing rapidly towards the use of coniferous species. The Nature Conservancy had reviewed the position and had taken steps to ensure perpetuation of the more outstanding woodland samples. Hence Wistman's Wood and Black Tor Copse were declared as Forest Nature Reserves in 1961.

(2) The New Forest was given as a unique area where the Forestry Commission had been placed in the role of Crown trustees under the 1949 New Forest Act. An agreement had been reached

* This brief summary of Mr. Hemsley's paper has been prepared by the Author himself.—Ed.

between the Forestry Commission and Nature Conservancy whereby a wide range of key habitats were the subject of special liaison and management consideration. These included three Forest Nature Reserves: Matley and Denny, Mark Ash, and Bramshaw Wood.

(3) Poole Harbour, which was in many senses one of the vital areas of the South Coast, had been the scene of much activity. The outcome of the Brownsea Island case, and the handing of this pre-eminently multipurpose case into the care of the National Trust, along with the successful setting-up of the Studland Heath N.N.R. in September, 1962, has done much to stabilize the situation.

(4) Supporting services for County Naturalists' Trusts had been given in problematical cases such as Langstone Harbour in Hampshire, where the Hampshire and Isle of Wight Naturalists' Trust were playing a key rôle in conservation of the coastal marsh.

Such a series of cases could show the many paths of action available and the rôle of the official body in securing acceptable solutions.

Moving on to define some of the more important aspects of contemporary land use and patterns of trend, the speaker gave a series of broad headings under which the greater proportion of regional cases could be categorized. These included:

- (a) Agriculture with the trends of reclamation, mechanization and the advent of mechanical hedge cutting.
- (b) Toxic sprays and chemical additives—crops, orchards, marginal land and mosquito control.
- (c) Drainage in the wider sense.
- (d) Caravans and camping.
- (e) Car ownership and mass movement.
- (f) Changes in the pattern of woodland management.
- (g) Power industry and power lines.
- (h) The Southern drift of population.

Some of the issues arising under these headings were touched upon.

Finally some major questions of a wider biological nature were posed, the answers to which were exercising the minds of conservation officers everywhere.

- (a) What wildlife can the general countryside be expected to maintain, bearing in mind the steady loss of the "biological buffer" due to more intensive agriculture?
- (b) Will National Nature Reserves constitute viable units? Such subjects as the size factor, isolation of populations, movement between populations and gene flow, must clearly be involved.

- (c) Will popular demand ever mobilize to the extent which may be desirable for conservation of a fully representative series of habitats and plant and animal populations?
- (d) Are the needs of research and allied study facilities adequately provided? Some reserves must be capable of sustaining these functions without suffering irrevocable change.
- (e) Finally, the last and possibly the most fundamental issue. How much of the total available energy will man succeed ultimately in diverting and circulating directly through his own highly selective and specialized channels?

It was towards such problems that the minds of conservation officers were turning, and there was much new ground to be explored.

THE HERBARIUM BOTANIST AND CONSERVATION

D. H. DALBY

(Imperial College, London)

THE majority of the papers due to be read at this Conference deal with methods of conservation in the field, or with matters of organization and administration. Mine differs in that its subject is the relationship between conservation and one particular group of people—the so-called “herbarium botanists”. Why should they be selected out of the numberless other classes of humanity? I suppose that it is because the collecting of plants for the herbarium is regarded as constituting a serious threat to much of our flora.

Right at the outset I can say that, at the bottom of my heart, I believe that the collecting of plants is wrong. But at the same time, as a scientist, I think that some collecting must be permitted. This is a moral dilemma. I understand that even the Nature Conservancy has a herbarium.

Who are these people—these herbarium botanists? For the purpose of this discussion I will interpret them as being all those who work in, or with, or who build up a herbarium of preserved plants themselves. We may classify herbaria, and those who work with them, into two main categories. Firstly there are those national herbaria, where the primary purpose of research is the study of the floras of foreign countries. Here too I will include certain university herbaria where the primary study is again of foreign floras. Secondly, there is the vast majority of our British herbaria, where the collections are devoted primarily or exclusively to plants from our own islands.

These two broad groups differ enormously in their relevance to the present discussion, and we must never generalize when we uphold or condemn the making of botanical collections.

National herbaria

The research performed in the national herbaria is largely directed towards monographic revisions or towards floristic treatments of particular areas, usually involving material collected from abroad, perhaps the Middle East, or tropical Africa. The amount of material collected from these countries (although possibly overwhelming to the individual botanist faced with vast piles of boxes of sheets) is nevertheless almost always extremely small in relation

to the number of plants left growing in their native localities. In fact, the sampling of such areas which may be very inaccessible and difficult to traverse, can never be carried out on an intensive scale over the whole area being studied. Many places will not be visited at all. The threat to the native floras from over-collection may thus be regarded as being too small to matter.

Furthermore, the botanists working on this herbarium material usually are in no position to carry out critical studies on fresh material (some in fact prefer not to), and if deprived of herbarium collections would have virtually no material to permit the continuation of their studies. Research on such floras would thus come to a standstill. My general conclusion here would be that collecting expeditions to areas little known botanically may be a mixed blessing to the curators of the herbaria responsible for receiving them, but they are unlikely to constitute any real threat to the native floras.

Herbaria devoted to British plants

From the point of view of organization we may roughly divide the remaining herbaria, primarily devoted to British plants, into three main groups. First, there are the local museums and so forth, often maintained by local authorities. Second, there are teaching and reference collections in schools, training colleges and universities, and finally there are the collections made by private individuals for their own personal use. Such a classification is useful for discussion, but, like all classifications, is not fool-proof. We may now deal with each in turn, digressing where necessary.

Local herbaria

Those collections attached to local museums and the like vary enormously in size and quality. They are often based on the collections made by prominent local naturalists, and without personal investigation one cannot tell whether expertise or sheer industry will have predominated in their original synthesis. If these collections contain specimens gathered locally before the onset of planning, development and the other symptoms of our sophisticated age, they may be of immense value to, say, the compilers of local floras seeking early records and past distributions. The possible damage caused by the assembling of these early collections is now past history, and it is best for us to extract such information and morals as we can and then move on to the present-day operation of such herbaria.

If these local herbaria are being added to at the present time, they may well constitute a threat to certain rare species, if only because attention is being repeatedly directed to the same geo-

graphical areas. The reality of the threat will of course very much depend on the degree of enlightenment shown by the curators of the collections. A balance must always be reached between a proper representation of the local flora for record purposes, the use of the collections in aiding school children and interested amateurs in identification, and the need for preserving such species and habitats as remain. There is always the "pull" of rarities—many people are impressed by rarity, in the same way as they are by money value. Show a boy a fossil ammonite—and his reply most likely will be "Cor, how much is it worth?" A museum curator may well have to answer such a question, though we need not.

Educational herbaria

The educational aspects of a herbarium feature highly of course in those built up in the teaching departments of universities, training colleges and schools. They may be used to demonstrate particular plants, as illustrations to, say, a course in morphology or economic botany, or they may be used more particularly for the teaching of herbarium methods and the techniques of taxonomic research and the fundamentals of botanical classification. Such collections, incidentally, are often restricted to flowering plants, because whilst it is generally agreed that one can study the taxonomy of the higher plants, it is only too often believed that there is no "taxonomy" of the cryptogamic groups—instead there is "comparative morphology". In all cases however the collections are suited to a particular purpose, and are in use, thus justifying their existence.

I may say here that this is not, of course, the whole story. I have seen *Cryptothallus mirabilis*, not yet I believe generally regarded as a common plant, collected in quantity and used for a student practical class in one university department. This I regard as a scandalous misuse of plants which should have been left alone.

It is when we turn to the educational value of requiring students to make their own individual herbaria that our doubts may be aroused. Obviously one important feature is that students must thus see the plants alive when they collect them, and will have the opportunity to identify them. The names thus learned will be attached in their memories to specimens seen by them, personally, in the field. This always has a greater impact than the giving of names to material collected by someone else. In this way students do certainly learn something of their native flora. They will of course also learn something of herbarium technique as a particular example of the need for precise recording in the field, and for care and delicacy of hand.

What should students collect in these study herbaria? Opinions will differ—and it is perhaps not desirable that they should all be the same. But it is clear that they must always avoid rare species, and should also avoid rare habitats. Habitats, as well as their constituent species, can disappear. This sort of problem, incidentally, becomes particularly acute in areas, be they rich or poor floristically, neighbouring on Field Centres which are visited year after year by student parties.* I believe that the decline in the aquatic vegetation in the neighbourhood of Flatford Mill is partly to be attributed to over-collecting by students.

I advise our students at Imperial College to collect stamps if it is rarities that they are after—and I say that in scientific circles no credit is given for the harvesting of rare species. As a result, we do not find our students collecting rare plants for their herbaria, but instead they concentrate on the more common species which are in any case the more important ecologically. There is some evidence that the amassing of such a herbarium during a student's first or second year does positively help him to become acquainted with the British flora. But what of those students who would definitely not want to make a herbarium at all, not because they are ultra-sensitive in matters of conservation, but because their interests lie in different fields altogether? You may well ask whether such a student, with no interest in field-work, no interest in taxonomy, or morphology or ecology, should have to bother himself with building up a herbarium at all. Is the collecting of plants by such a person merely robbery of the countryside, and would he not be far more productively occupied with a stack of papers on, say, the rôle of mitochondria in respiration?

My own interests lie primarily in the fields of taxonomy, morphology and ecology, yet I have never wished in any way to build up an extensive herbarium of flowering plants. In fact I restrict mine to a few groups (grasses, sedges and so forth) which I use to refresh my memory when, incarcerated in London, I forget what they look like. I can thus be sure that it is not always necessary to build up a general herbarium—even for the would-be taxonomist, morphologist or ecologist.

Although I say that the mere collection of rarities receives no credit in scientific circles, of course they do have their place in certain more specialized scientific studies. Such species may reveal clues as to their habitat requirements because of their scarcity at the limits of their range of tolerance, and distributional patterns of this kind may be clearly revealed by such projects as this Society's *Atlas of the British Flora*. But we must be on our guard against

* See "Conservation in an educational nature reserve", pp. 46–51.

being too drawn to rarities because of their unusual distribution patterns. Detailed biological studies (such as those of the "Biological Flora" published in the *Journal of Ecology*) may be easier to prepare for rare plants than for those which are more common, since there are fewer localities to visit, the habitats perhaps less variable, and so on. Whether parallel studies on more common species might not be even more valuable, in spite of the extra work involved, is beyond my scope today. The fact remains that, for many scientific purposes, rare plants may be of considerable importance, and whilst their mere collection is to be condemned, their proper study is not.

Personal herbaria

This brings us to the final category—that of the private herbarium assembled by the private individual—and it is here that I believe the greatest threat to our flora lies. It is only necessary to delve into some of the old collections now in our larger herbaria to see how generously some of our predecessors helped themselves to, say, the bryophytes of certain waterfalls in Killarney or to the riches of Ben Lawers, and we can see only too clearly that in many instances there is more material residing on herbarium sheets than there is now growing in nature. Can we be absolutely sure that this spirit of collecting is banished for ever? Some individuals seem to have a stamp-album approach to their botanizing—they must have a specimen from, say, every vice-county where the plant grows. Often of course this does no visible harm, but it could well be disastrous to, for example, a species limited to a single colony only in a vice-county at the limits of its range. This kind of stamp-album acquisitiveness is poles apart from say the collecting of a miscellany of specimens from Nigeria for study at Kew. They represent almost the extremes in motive in assembling herbarium collections. One must resist strenuously the inner wish to collect simply for the sake of adding to one's botanical stamp-album. Some do not even do this, I fear—they fill polythene bags with specimens, simply because, it would seem, the plants come away in their hands.

The pride resulting from having rarities in one's own collection is paralleled by that of being in a position to show others, the less fortunate, where rarities grow. This is a kind of one-upmanship, and probably has its place in the practice of what one may call "social botany". Normally one can do worse than keep one's mouth shut with regard to the localities for rarities. This applies particularly to the leaders of school and student parties—who should remember the infectious tendency for every person in the

party to want a piece or specimen for himself. I saw, a few years ago, an incident where a fine specimen of a lizard orchid was pointed out to a student party. Those at the front looked at the flower head reverently and said the right things—but a student at the back pulled it up and slipped it in his vasculum when the rest had moved on. He showed it to me later, in triumph, on the London train. I have another story about man orchids on Box Hill—but I shall not tell it now. The moral is much the same. And then there is the progressive decimation of *Cypripedium calceolus* in the Pennines.

Why should orchids be doomed in this way to pass on to the herbarium sheet *via* the tin of burning sulphur? It is because they are “interesting” plants. Like certain other “interesting” species (and “interesting” distribution patterns) they are rare, they differ in their form or colour. They attract attention because they diverge from the normal run of things.

But plants can be “interesting” for other reasons too. Thus there is the understanding of population changes or phenotypic plasticity—where a ubiquitous species may be far more informative than a rare one. This is however a more purely scientific kind of interest. Again, there is the aesthetic attraction of so many plants—which an artist may find interesting because of the contrast in shapes and colours and textures. We need not be practising artists to appreciate beauty in plants, and I often get as much pleasure from, say, looking closely at an *Erica* leaf as many would from some curious intergeneric orchid hybrid at an R.H.S. show. We need not be ashamed of this—it can be a powerful weapon in nature conservation. We all have a right to enjoy looking at flowers, or of getting to understand the character of a stretch of unspoiled vegetation, and we can enjoy it even if we have no technical botanical knowledge or training.

There are some members of this Society who genuinely and earnestly believe that no plants should ever be collected, for any purpose whatsoever. I reluctantly cannot agree with this extreme view, but feel all the same that we must be grateful to our extremist fringe for stating their uncompromising views. It makes us all analyse the ethics of botanical collecting, from scratch. I think collecting is sometimes quite justifiable even in Britain, and even occasionally when it involves rare species. But to avoid such collecting being mere vandalism, one must go further than merely picking the thing, looking at it and then discarding it. We are no more than vandals if we harvest baskets-full of bluebells (*Endymion non-scriptus*), and then throw them away because they’ve not got the stamina to stay turgid for hours in the sun. Turning up a herbarium sheet in years to come, and gloating over it, is scarcely

any better. No, when one has collected a specimen, one must do something with it, draw it, photograph it, measure it, analyse it, describe it meticulously—in other words, justify having collected it.

The mass-collection for biometrical analysis is a particular example of how ill-chosen techniques can lead to very harmful results biologically even if very gratifying statistically. Such mass-collections do not justify us in ravaging populations in a destructive manner. The end does not always justify the means. We must not pull up gentians by the roots. We must not remove the flower-heads from annuals—thus destroying their only method of reproduction. Judicious selection of *parts* of flowers, or the removal of separate leaves, together with the assessment of as many characters as possible *in situ* can enable biometrical population studies to be performed without harming the plants themselves. It is a particularly selfish attitude which encourages anyone to think that his own research is of such overwhelming importance that it justifies the destruction of plants which others may also wish to see and study.

Exchanges

Many botanists used to, and a few still do, augment their personal collections by means of material received through various exchanges. The essence of such exchanges is that contributors collect many duplicates of plants considered interesting, and make a swap of specimens *via* the exchange's distributor. Obviously if we consider rare species as being interesting for the purpose of the exchange, then exchanges of this kind are potentially very harmful indeed. (The exchanges between national herbaria are rather different, and in general should not be regarded as constituting threats to the native floras.) It is gratifying to see that the exchange of flowering plants in this country has shrunk to almost negligible proportions. One way of facing this problem is that practised by the British Lichen Society, who do not operate an exchange. Instead they circulate a parcel of critical and otherwise interesting species (one specimen of each) to members for study.

The British Bryological Society still maintains an exchange, as it has done since its foundation as the Moss Exchange Club. It seems that, from the very simplicity of making herbarium specimens of bryophytes, this exchange could be potentially harmful to rare species. As with the flowering plants, I do not think that moderate collection of the more common species does any harm, but with rarities it is different. As there might be a temptation to members to submit scarce species to the B.B.S. Exchange, I have given instructions to contributors never to send in British material of rarities, but instead to collect abroad where such plants are common.

I also urge members to regard interesting species as being more than just something to fill the gaps in their stamp-album herbaria. This is in fact an attempt to come to a compromise between the needs of conservation and the wishes of members to maintain their own herbaria.

You may feel that an exchange of this kind is outdated. I however feel that there is still a place for it, provided that it goes further than just being the stamp-album. The scientific study of cryptogamic botany cannot be continued without the collection of specimens. This is due in the main to the lowly organization of the plants themselves, and the obscure nature of specific differences. All the same, the minimum quantity necessary for identification should be the maximum amount collected for the herbarium. One is not always in a position to say (with absolute truth), "Oh, there must be some more about somewhere near"—there may be, or there may not. The cryptogamic botanist is, in fact, less likely to have his conscience troubled from outside, because a bystander is not so easily able to object with justification when he thinks that the harvesting has exceeded reasonable limits. It is very often quite impossible to know whether or not any of the species remains after the harvesting has taken place. But we can still urge moderation, and hope that nothing will be collected in excess of that required for study.

Conclusion

To conclude this discussion of the relationship between the herbarium botanist and conservation, I should say that if botany is to continue as a science, collection of plants at times must be allowed to continue, and in most instances this collected material will finally come to rest in a herbarium. The individual collector, working in an over-cultivated, over-polluted and over-inhabited country like ours, must take particular care not to endanger rare species, and should not collect even common species from habitats rare in a particular neighbourhood. It is especially important for specialists not to mis-use their specialist knowledge by over-collecting plants which the less gifted might fortunately pass by.

It is apparently the position that the number of amateur naturalists (expressed as a percentage of the total population) is a good deal lower in a country such as Norway than it is in our own. This is probably because a vastly greater proportion of such countries is still in an almost unspoilt condition, and the native vegetation and fauna still extends over great areas. Although a high proportion of Norwegians live close to the land, the majority do not as yet value their flora and fauna as something to be preserved

—they take it for granted. It is only when these things become rare, and so more “interesting” that our attention becomes directed towards them. They then become the target of both collectors and conservationists alike.

DISCUSSION

(Prof. Valentine in the Chair)

Prof. VALENTINE: I wonder about the schoolboy who is beginning to be interested in natural history; he has got to be encouraged to collect a little bit, because if he is not he may not go on being interested.

Dr. DALBY: Yes, I agree; the point here, I think, is that the individual can be encouraged but not students *en masse* in the field.

Mr. HEMSLEY: Personally I think some kind of reserve is needed which is cropped on a rotational system for collecting. The great feature of this age is undoubtedly the education and the furtherance of information amongst the mass of the population, and I accept this as one of the primary needs of the modern society. Accepting these facts, we must make allowances for collecting. I suggest we make the thing quite clear and above board, and that we provide these facilities. Obviously we cannot do this for these rare and exacting species, but there is a great range of associations which will recover quite naturally and favourably if they are cropped in this fashion. A place to try this out would be at one of the Field Centres where the problem has become acute. The approach as a conservationist must be to adopt a positive and often unorthodox method—there is obviously great need for unorthodox thinking here; we are in a dilemma especially where the population pressure is great.

Mr. WESTRUP: As a schoolboy I was brought into botany when I started a collection, and I collected one or two rarities. It was these which really aroused my interest.

Dr. WALTERS: Surely one of the things you can tell your students is that they do not need to consign the rarity to the herbarium when a perfectly good colour photograph can be taken.

CONSERVATION IN AN EDUCATIONAL NATURE RESERVE

P. F. HOLMES

(Malham Tarn Field Centre)

Malham Tarn and a small estate round it is National Trust property, leased since 1948 to the Field Studies Council who use it as one of their Field Centres. With the agreement of the National Trust we have made the area into a Nature Reserve. It may be called an educational reserve in the sense that we teach field work to a great many students in it, but it is worthy of reserve status in its own right, especially botanically. At the Field Centre we have usually 50 students staying each week from early March to the end of October: 1500 in a year and some 20,000 have stayed here since 1948. This represents a very considerable human pressure, though nearly half of these are studying geographical subjects and are not primarily interested in the flora and fauna.

In addition, being National Trust property, the general public is allowed to walk through the estate, but these visitors are asked by nature reserve notices to keep to the road. With increases of pay and of leisure, with longer holidays and a vast increase of cars, the number of day visitors has grown beyond recognition since 1948, the Tarn lying within 40 miles [64 Km.] of large industrial areas of West Yorkshire and East Lancashire. School parties from these areas come by coach to Malham village—20 coaches representing 800 children is not unusual—and a fair proportion reach the Tarn.

This is our problem then: here is a superb place for a Field Centre, with everything on the doorstep; how can we keep it so for future generations of students and naturalists? We want to use it for teaching but not to spoil it by sheer numbers trampling and collecting. We want day visitors to enjoy walking through but not to do damage; and we want to preserve the wide range of habitats, where necessary taking active steps to do so.

Each week the students coming to the Centre, whether they be teenagers or adults, are given a short talk soon after arrival, and amongst other things are introduced to the problem of conservation. Material has to be brought back into the Laboratories for study but one or two specimens per group is all that is needed; there should be no uprooting normally and a number of species must not be picked at all. We have illustrated 15 of these banned species,

which include *Drosera* and *Pinguicula* which most sixth-formers want to take home, often at the request of their biology mistress, *Primula farinosa*, which people like to dig up for their rockery, all orchids, *Andromeda*, *Parnassia* and so on. There are many other much rarer species and this we say but do not list the species; it seems best not to draw attention to them. Most of our students come completely unaware that any sort of conservation is necessary in this country and this applies to University as well as Training College and School students. We make it part of our job to see that they leave the Centre at any rate aware of the problems and with a healthy respect for living things. Most conservation teaching is best done in the field incidentally, by example and by demonstration of what can happen.

In spring and early summer the Centre is often full of sixth-form or training-college biologists and this means taking out groups of 25 in the field. They usually know very few plants and there is no point in showing them the more specialized and sensitive habitats. There is unlimited scope and space outside the reserve, on the grazed grasslands, screes, and blanket bog areas, which are much more widespread communities, where 25 people do no obvious damage.

Many University Departments send parties to the Centre in the long vacations, and these often want to work in the more sensitive places such as fen, bog or mire, or to see as wide a range of species as possible. Until conservation creeps more into university teaching this is bound to be our most anxious time; university groups usually come under the direction of their own lecturers and we have to rely on their good sense and watchfulness. Conservation at a Field Centre is a multiple problem since courses are held in so many subjects, and specialists in one group of animals or plants are apt to think that nothing else matters. I have seen entomologists tear up vegetation ruthlessly in search of insects; 25 freshwater biologists can flatten a beautiful fen succession in a few seconds; and a bird photographer is usually oblivious of damage to vegetation provided he gets his shot of the bird on the nest.

I want to discuss now some of the areas in the reserve where conservation is a problem.

1. *Tarn Moss*

This is a good raised bog at the west end of the Tarn, whose stratigraphy and pollen analysis has been described by M. E. & C. D. Pigott (1959). There has been some burning of the surface in the past, to encourage heather (*Calluna vulgaris*) for Grouse (*Lagopus scoticus*), and spasmodic grazing, and these we have stopped

since 1948. It is good to find that *Andromeda* has increased steadily since burning ceased. The patches of heather have, however, been so badly attacked by Heather beetle (*Lochmaea suturalis*) in the last three years that I begin to feel that we may have to burn small areas again to keep some heather there. Certain interesting insects feed on it—Emperor moth (*Saturnia pavonia*) and Northern Eggar moth (*Lasiocampa quercus* var. *callunae*) for example—and I like to hear Grouse calling.

The surface of the bog is mostly no longer active, being predominantly *Eriophorum vaginatum* and *Deschampsia flexuosa*. But certain parts do approach an active bog surface with pools and hummocks and a fair amount of *Sphagnum*, Sundew (*Drosera*), Bog Asphodel (*Narthecium*) and Cranberry (*Vaccinium oxycoccus*), and these are the parts, of course, which everyone wants to look at. We have just marked off part of this area with four posts, within which nobody must go without permission, to ensure that this, at any rate, remains untrampled. Our goal must also be to make the surface of the whole bog as wet as possible to encourage *Sphagnum*, by blocking up old drainage channels which were dug to make it drier for *Calluna*.

2. Tarn Fen

This adjoins the raised bog and is flushed by base-rich water from the inflow stream. Here is a very rich fen vegetation, with a correspondingly rich insect fauna. It includes a number of rare species, especially *Carex flava* in one of its two British localities, so that we feel a special responsibility to conserve this at all costs. The fen is a habitat very susceptible to trampling and this reached such proportions a few years ago that we decided to construct a raised way over it since it has to be crossed to get to the raised bog. We tried an experimental stretch, for a year, of duckboarding supported on old railway sleepers, and as this seemed to work the whole stretch of 200 yards [180 m.] has now been spanned. This cost over £100 in materials and much voluntary labour, but it has been worth every penny, and it incidentally provides an excellent teaching platform without doing any damage to vegetation.

The fen is a dynamic habitat in which the most interesting stages may disappear unless steps are taken; fen carr is spreading at its expense. If it is left to develop naturally, future generations of students may have no rich fen to study and so I have got the Council for Nature's Conservation Corps coming in July and one of their jobs will be to pull up *Salix* saplings and perhaps recreate an open pool of water which has filled in over the last 25 years.

3. *Woods*

There are some 30 acres of woodland in the reserve, not natural but adding enormously to the interest and shelter of the Centre, which otherwise would be very exposed at 1300 ft. [390 m.]. Most of the trees are over 100 years old—beech (*Fagus*), ash (*Fraxinus*), sycamore (*Acer pseudoplatanus*) and larch (*Larix*) mostly—and there is a steady loss by blowing down each winter: 70 in 1962 and more in 1960. There has been some regeneration of ash since myxomatosis eliminated the rabbits in 1955, and with the National Trust we are replanting bare areas so that there will always be trees coming on. The question of clearing up brash and fallen timber concerns us. One cannot have the public walking through this National Trust property thinking it looks untidy and neglected, yet on the other hand a tidy wood is poor for the naturalist. We compromise by clearing the parts near the road and leaving as much brash and old timber as possible at the back of this, to provide habitats for fungi, myxomycetes, mosses, lichens, insects, snails and incidentally some protection for tree seedlings. An unexpected problem is the conservation of bark on fallen timber; if too many people were told to search behind old bark for beetles or woodlice or snails, the wood could be stripped of this habitat in a short time. By piling brash into heaps we have also created nesting sites for birds which require bush cover, so that Whitethroats (*Sylvia communis*) and Blackcaps (*S. atricapilla*) have nested for the first time in the last few years and Song Thrushes (*Turdus ericetorum*) have increased noticeably.

4. *Cliffs and screes*

Just behind the Centre is a limestone cliff with a wonderful show of limestone plants on it, but spreading over the steepest part is a vigorous growth of *Cotoneaster microphyllus*, presumably planted in the last century. The time may come when this will seriously deplete the available cliff face of its natural flora, so that we have got to start controlling it, again for the sake of future generations. This may be another job for the Conservation Corps, who last year repaired the dam at the outflow end of the tarn to prevent a serious breakthrough.

On the scree below this cliff is a small colony of the dark red helleborine (*Epipactis atrorubens*), which has illustrated rather well the difficulties of conserving an uncommon species. It was several years before we discovered the colony, due to sheep and rabbit grazing, though it is only 300 yards from the house. We surrounded the best plant with wire netting but slugs ate it. The next year I applied slug powder and it bloomed profusely. And now, due to

lack of rabbits, *Sesleria* is colonizing the scree and I may have to keep some of the scree free of this to preserve the *Epipactis*.

5. *Limestone pavements*

Bare areas of limestone with joints opened up by solution into deep crevices, or grykes, are a characteristic part of the Malham landscape, which need careful preserving. These pavements provide an easy and profitable source of the best stones for rockeries, and in the Dales National Park I am glad to say we have recently won two appeals against orders to stop this large-scale removal of rock. To the botanist the grykes provide an interesting habitat, with a partially woodland element in the flora, which is ideal for demonstrating different requirements of plants with regard to aspect and shade. They are, however, thinly populated and subject to over collecting, and do contain some uncommon species, such as *Actaea spicata*, holly fern (*Polystichum lonchitis*), lily of the valley (*Convallaria majalis*). We try therefore to restrict collecting from pavements as much as is practicable.

We have recently added a 10-acre field containing pavements to the Reserve, and with a grant from the Nature Conservancy have fenced it round against sheep, rabbits and humans. Here some long-term experiments are being started to see whether woodland can be established on limestone pavement at 1500 ft. [450 m.], if grazing is excluded. There is evidence that pavements formerly carried woodland, and the new National Nature Reserve at Colt Park Wood, 10 miles [16 km.] away, shows what such woodland may have been like. There is no doubt in my mind that it adds greatly to the stimulation and interest of students in residence at a Centre to see and hear about such experiments in progress. Grazed and ungrazed grassland on two sides of a fence is also an excellent demonstration.

6. *Calcareous marsh*

Half a mile outside the Reserve is an extensive calcareous mire. It provides an open wet habitat in which are found a number of rare relict plants, notably *Bartsia alpina*, *Carex capillaris* and *Equisetum variegatum*, which probably owe their survival there to the habitat having remained open throughout the forested periods of post-glacial time. There is clearly no point in taking most students to see such an important corner, yet I cannot forbid visits since it is outside the reserve and it is wide open to the public (if they are prepared to get their feet wet) and to school parties on day visits. I hope that one day this Mire may be acquired and added to the National Trust Reserve.

7. *Meadow by Tarn*

Between the Centre and the Tarn is a field which has been transformed since sheep were removed in 1948 and rabbits eliminated in 1955. We have gained a wonderful show of cowslips (*Primula veris*) and of marsh vegetation on the edge of the water, and part of the field has been planted with young trees. But a rank growth of tall herbage has developed—*Centaurea nigra*, *Succisa pratensis*, *Holcus*, *Deschampsia caespitosa* and other grasses—and these are eliminating interesting plants of the former short turf community. Frog orchid (*Coeloglossum viride*) has disappeared. Dr. M. E. Bradshaw tells me that some of the rarer *Alchemilla* species are disappearing also and that formerly part of this field had the highest number of species of *Alchemilla* in a small area that she has ever seen. Clearly I shall have to restore part of this field to its former state, perhaps by regular cutting.

But conservation is no simple matter. The rank growth of herbs and grasses has provided an ideal habitat for small mammals such as the Short-tailed Vole, valuable for showing to students within 100 yards of the Centre and attracting Kestrels (*Falco tinnunculus*) and Owls (*Strigidæ*); and this winter a flock of Bullfinch (*Pyrrhula pyrrhula*), Goldfinch (*Carduelis carduelis*) and Greenfinch (*Chloris chloris*) fed for a week on the seed-heads of *Centaurea* which stood up through the thick snow covering everything else.

I hope I may have showed you how conservation in the educational reserve at Malham Tarn is a complicated matter with many interests to reconcile: the present teaching of students in a variety of subjects, the passage of the public through what is National Trust land, and the preservation of rare species and of habitats for future generations to study and enjoy.

REFERENCE

- PIGOTT, M. E. & C. D. (1959). Stratigraphy and pollen-analysis of Malham Tarn and Tarn Moss. *Field Studies*, **1**, 84–101.

DISCUSSION

Prof. VALENTINE (*Chairman*): Why do we have Field Centres in such attractive places? Surely there are other places which are not so vulnerable which could be used for teaching, and the more critical places could then be used in other ways.

Dr. ASHBY: Regarding the disappearance of hedgerow timber, does not Mr. Hemsley think that it is due to a change in attitude of the country worker, rather than to the change in characteristics of the implements that he is using? A pair of shears will go through a young leader just as easily as will an automatic saw.

Mr. HEMSLEY: Yes, I suppose it is a bit of both. Undoubtedly the stimulus in production of hedgerow timber seems to be dropping away in spite of the efforts of certain bodies which have been made to push it up a little. I do think that one must not generalize too much on these issues. Coming up by road yesterday, I was delighted to see how much hedgerow timber there still is, in direct contrast to certain areas in the south. I feel sure I am on fairly good grounds here when I claim that, certainly in the south and south-west, the advent of mechanical equipment is the real culprit—or should I say the main factor—in the disappearance of hedgerow timber. In the old days it was the practice to maintain interesting and good-looking maiden material and leave it standing for a future crop.

Miss ROB: In the North Riding [of Yorkshire], in a number of cases before the War when the big estates were broken up and bought by the tenant farmer, he felled every tree to get some money to pay for some of the cost. Nowadays, not only are they using a mechanical hedgecutter which takes every sapling which comes along, but the actual hedgerow is being stubbed out and replaced by a wire fence.

Mr. WESTRUP: In my part of the country most of the hedgerow trees and the hedgerows are destroyed, and are not replaced at all. The fields are laid bare one to another and to the road, which is separated from them only by a bank.

Mr. TORRANCE: Speaking as a member of the National Farmers' Union, I come from the Midlands and the Highway Authorities there are the chief culprits. They insist on the hedges being kept low. With regard to the other points, farmers, in spite of subsidies, are working on such a small margin that they must bring every possible square yard under cultivation mechanically. The curving hedge or marl pit have been done away with in order to facilitate mechanical cultivation.

Mr. MILNE-REDHEAD: Surely, Mr. Chairman, keeping the hedges low and allowing trees to grow up in the hedges are two quite different things. I don't see why the odd hedgerow tree should not be encouraged, even allowing for the modern policy of keeping the hedges low and reducing their number. Why should not trees be allowed to grow up to replace those that have been felled to make money?

Miss ROBB: In the case of arable land, trees in the hedgerow do cast a good deal of shadow and stop good cropping along the hedgerow.

Mr. HEMSLEY: There is some body of opinion and thought on this subject, that the drop in yield due to the exposure following denudation of the standing material in the hedgerows might be an important and significant factor here. It is possible that the small apparent increase in yield that will result from taking into cultivation the fifteen or so yard half-circle previously overshadowed by a tree may be more than counterbalanced by the much greater but less spectacular loss of yield due to increased exposure.

Miss ROB: It is difficult to get the individual farmer to see this.

Mr. HEMSLEY: Really the question, Mr. Chairman, as I would see it, concerns the breakdown of the larger land holding units among a series of smaller individuals. The individual is less cushioned and has less elasticity

in his long-term policies of management. The growth of various protectionist organizations, who are now being called upon to fulfil the traditional rôle of the large estate, is proof of the need, and it is they who must be prepared to take the long look, and not be too worried if things went a little flat from time to time.

Prof. VALENTINE: I would like to ask Mr. Holmes a question. He mentioned that large numbers of the general public visited the [Malham Tarn] Reserve. Does he make any attempt to tell them about the Reserve, either in the form of talks or printed material?

Mr. HOLMES: Yes, Sir. We have just, this last year, constructed a display window (about 8 ft.) at the back of the building around which the public pass, in which we put specimens and maps and tell them about the place and try to interest them that way.

Prof. VALENTINE: Do they have to pay for it?

Mr. HOLMES: No, not at all; this rather shakes them, I think.

Prof. VALENTINE: I think this is a mistake.

Mr. HOLMES: Do you? Why do you say this? Do you think people like to pay for things these days.

Prof. VALENTINE: If they had to pay, I think they would value it and take more notice of what you have to show them; also it would be a very useful source of income.

Mr. HOLMES: One would have to pay someone to take the money.

Prof. VALENTINE: It would provide an opportunity, when they come in, to stop, and you would say: "This is a Nature Reserve; here is the place you go to find out about it."

Mr. HOLMES: It is manpower. If you could make enough money to pay the man it might be useful.

Prof. VALENTINE: I was rather impressed when Dr. Ovington showed some pictures of Polish National Parks with a display board and someone giving talks to parties of the public. It seemed to me that this was important. It is the education of public opinion which is the important thing in conservation. And the Nature Reserve, such as your Reserve, is one of the places where one can do this.

Dr. WALTERS: Isn't the problem very much a financial one. Take the case at Wicken Fen where we are in exactly the same position as Mr. Holmes is in at Malham.

Prof. VALENTINE: But I have solved the financial problem.

Dr. WALTERS: No, because there is a critical minimum number of people you have got to get through to justify the cost of putting up the facilities to make them pay and this sort of critical minimum number is the sort of thing we are all attempting to struggle with. I think it is too small at Wicken; it may be too small at Malham.

Mr. HOLMES: It depends upon the weather we get at week-ends. It needs fine weather.

Dr. WALTERS: This is where the Polish organization wins hands down, for it doesn't really matter when the money is coming from the State. Perhaps the Nature Conservancy in this country might be prepared to spend some money in this way.

Prof. VALENTINE: I seem to remember going to one or two Nature Reserves in the United States where you have to pay some small sum to visit. There was a checkpoint where literature was available for you to buy and there was material about the Reserve at the entrance, which you could buy.

Mr. THOMPSON: May I say that if people have to pay at the gate, they may be more keen on getting something out of it.

Mr. BELLAMY: Can we perhaps levy a tax upon the number of herbarium sheets collected? But I must say this would make some of our research very expensive.

Mr. WILKS: Surely there is here the case where one might be allowed to enter a field full of fritillaries and for a certain fee go out with a fistful of these flowers.

Mr. WESTRUP: You are now limited to 12 flowers for your shilling.

Dr. DALBY: It would be interesting to see the balance sheet of this over a number of years.

Mrs. RUSSELL: One point I would like to bring up at the moment—that is, this idea of educating the public. I have just had an experience in my own county, Essex, where the Naturalists' Trust were appealing to all the local Councils to support the setting up of a Nature Reserve. When the circular went round, one of the Council members asked me what all this meant, so I explained most carefully the value to the neighbourhood and to the future of these things. She went away prepared to convince the rest of the Council. She could not get anywhere; the rest of the Council said: "This does not concern us; we are not going to have any of these things around our part. Anyway, once they set up a Nature Reserve, no one would ever be allowed to go in." I did not know what to say after that, because they turned it down flat.

Mr. WILKS: One of the Municipal Boroughs in Kent suggested that we should circularize all the Local Authorities, and the County Council, to join the Trust. We did so and were pleasantly surprised to find that all but three of the local District Councils have joined the Trust and they all pay a handsome subscription. One of the three that did not join was the one that suggested it. I suppose there is a moral in this somewhere!

Mr. TYNAN: It is rather interesting to reflect that in the North East, where they have a reputation for being rather careful, the County Planning Officer of Northumberland declined to join the County Trust. There is a Trust which has persuaded the County Planning Officer of the time being to be Chairman of their Trust.

Dr. DONY: That again, Mr. Chairman, is not always as happy as you might think. For his reply often is: "There's an awful lot I can't tell you people".

Mr. MILNE-REDHEAD: Have the Regional Officers considered the railway banks which are going to be released when the branch lines are closed? These, at the present moment, are a wonderful reserve of wild flowers, cowslips, primroses, etc. Between Newport and Brecon you get a most wonderful stand of globe-flower (*Trollius*) between the wire fence and the railway where the sheep cannot get at the plants. There are many good

areas which could be exploited by the gypsies in next to no time once the protection of the railways is removed. I think it is a matter which should receive consideration at an early date, if it has not done so already.

Mr. HEMSLEY: Mr. Chairman, I must say this has not received any attention in the South West, but some years ago, when the Meon Valley Railway (in Hampshire) closed down, the figure required was £17,000 for a short section! This is why we have not worried much about them since; this is beyond the resources of any normal conservation body. I do see another astronomical figure—something like £45,000 being asked for a short stretch of one of the Kent lines. Of course, much of the land is valuable for development.

Mr. WESTRUP: The Meon Valley line is rapidly being colonized by bushes and all the other plants will very soon be lost. I can see no one spending that amount of money to acquire it, for just as much money again would have to be spent to clear it for agricultural use. I can see no point in the inflated values just quoted.

There being no further discussion, Prof. VALENTINE then called the session to a close.

THE NORTHUMBERLAND AND DURHAM NATURALISTS' TRUST

MARGARET E. BRADSHAW

(University of Durham)

THE Northumberland and Durham Naturalists' Trust was incorporated on 13th March 1962 and held its Inaugural Meeting in May; thus it is about one year old. I feel we are very much a babe amongst those Trusts represented here. We have 330 members. Our registered office is in Newcastle and our general secretary is Mr. Tony Tynan, to whom we owe a great deal. Our organization has a Council formed of very keen and interested amateurs and with two University centres within our area we do not lack for University support, which is not always the case where Universities exist within County Trust areas. We are fortunate in having the chairman of the Nature Conservancy resident in Northumberland, and he agreed to be our President.

Having given you the bare statistics of our organization, I would like to give you a short account of what I term our botanical responsibilities.

Northumberland and Durham lie half-way between the south coast of England and the north of Scotland. The two counties cover just under two million acres and are 90 miles [144 km.] from south to north. There is high ground to the north (Cheviot, 2676 ft. [c. 800 m.]) and west (Pennines, 2000 ft. [600 m.] in Co. Durham); the east has affinities with the south which will be mentioned in detail later. Fortunately for me, Dr. W. A. Clark covered a large part of that northern upland area in his most interesting paper yesterday. On the Scottish border there are some small bogs which are being studied by Mr. D. J. Bellamy and are well worth considering for conservation. Other habitats are the areas of open water, such as Crag Lough, of which we have few in Co. Durham. Such areas have to accommodate the interests of the naturalists as well as of those who like water-sports. These interests conflict considerably, particularly with the bird life. The wooded ridge near Crag Lough is whinsill, of the same sheet as in Teesdale and the Farne Islands. This whinsill and the few limestone outcrops in Northumberland, being relatively base-rich localities, provide outlying stations for northern records of southern plants such as tor grass (*Brachypodium pinnatum*).*

* Distribution maps of the species mentioned in this paper are to be found in Perring & Walters (1962).

relatively little explored botanically. Dr. G. A. Swan has been active here and last year found many new stations for the spiked rush (*Eleocharis austriaca*).

Another outstanding feature of Northumberland is its coastline which has a sand-dune system almost absent from Co. Durham. Here is the northern limit of several species more frequent in the south, but the quantity of purple milkvetch (*Astragalus danicus*) here would probably be the envy of many people from the south. Bloody cranesbill (*Geranium sanguineum*) is frequent, and on Holy Island the marsh orchids, *Dactylorhiza purpurella* and *D. incarnata* make the dune slacks look like bulb-fields.

Co. Durham is very much a frontier zone; an analysis of the maps in the *Atlas* (Perring & Walters, 1962) has given 50 species of south-eastern distribution which have their northern limit in the east of Co. Durham. The magnesian limestone in the east which links up with the Chilterns and the Downs may have formed an Al for plants from the south. Some examples are dropwort (*Filipendula vulgaris*), perennial flax (*Linum anglicum*), woolly thistle (*Cirsium eriophorum*), tor grass (*Brachypodium pinnatum*), field rose (*Rosa arvensis*), field maple (*Acer campestre*) and black bryony (*Tamus communis*).

In this magnesian limestone area important habitats are the coastal denes such as Castle Eden Dene, a Local Nature Reserve, and the man-made exposures, the quarries on the western escarpment. These are rather unusual in having as their primary colonizers sea plantain (*Plantago maritima*) and the blue moor grass (*Sesleria caerulea*). Today, these areas are being opened up again by very extensive quarrying either for dolerite or the underlying sandstone which is crushed and used in the building industry. Furthermore, many quarries are holes, and holes are very desirable places for the disposal of domestic refuse and in this region for colliery refuse.

In the west of the county is the Teesdale area where many northern species have their southern limits, e.g. wood cranesbill, (*Geranium sylvaticum*), alpine bistort (*Polygonum viviparum*) and the tea-leaved willow (*Salix phylicifolia*). Many of these are meadow plants and it is to be hoped that the traditional methods of pastoral farming will continue. Some species show links with the east of the county, e.g. globe flower (*Trollius europaeus*), bird's-eye primrose (*Primula farinosa*) and blue moor grass (*Sesleria caerulea*).

I hardly need to remind members of this Society that Teesdale is also the home of the famous Upper Teesdale flora. The fortunate combination of geology and phytogeographical evolution has left us the heritage of a unique flora. Unlike that other Mecca of

plant-geographers, Ben Lawers, there is no deterrent in the form of a 1500 ft. [450 m.] climb or long walk between the highway and the botanically rich areas; in Teesdale there is a surfaced road. The area is very popular with tourists and an indication of this is shown by the 50 people at Cauldron Snout on a miserably cold Sunday in May, and 10 coaches and 300 cars at High Force on Whit Sunday last year. Seventy naturalists visited the area on one Sunday in June. Upper Teesdale is not isolated today.

Cordial discussions have been taking place between the owners and Trust representatives, and arrangements are being made to provide voluntary wardens to assist the Estate keepers at the most vulnerable time when the gentians are in flower.

(A slide showing people crouched or kneeling on the turf demonstrated that plants can be identified in the field without having to gather them. Post-Whitsun depredations and litter of dead globe-flowers (*Trollius europaeus*), sandwich papers and broken bottles were also shown.)

The Durham coast is not very attractive, but near Teesmouth there is an area of sand-dune and salt-marsh; it is not very rich but it is all we have got and so is valuable to us. The saltmarsh is almost the most northern station for common sea lavender (*Limonium vulgare*) and the sand-dunes for yellow-wort (*Blackstonia perfoliata*). Oxford ragwort (*Senecio squalidus*) is a common dune plant. Although not a Trust achievement, members of the Trust's planning committee and the Teesmouth Bird Club were instrumental in preventing chemical waste being tipped on to the better part of the salt-marsh. The sand-dunes also have several interesting species.

A little further north of this, the magnesian limestone outcrops at the coast and here we have more of the limestone flora. Here we hope to get our first Nature Reserve*, 1.5 acres of cliff top, minute in comparison with the Scottish small reserve of 200 acres, but worth having in this county. The area which we hope to have as our second reserve is 75 acres of riverside gravel. It is encouraging to find that the owners are interested in it being formed into a nature reserve. Negotiations take a long time and we do not know when this will be achieved. It is an exciting prospect, as apart from a fine alder wood there is little plant life which must be conserved and we can develop the area to make the best use of it. This will be done with the educational objects well in mind.

(Two pictures were shown of the ponds at Brasside, one of open water with marginal vegetation, mainly bulrush (*Typha latifolia*), and in contrast, a second containing tin cans, bottles and scum from

* This site, Blackhall Rocks, was acquired as a Nature Reserve on 18th May 1963.—Ed.

refuse.) Although this is a S.S.S.I., a third pond has already been completely filled in. All over the county areas of water are being filled in and streams put into culverts.

On Holy Island the introduced pirri-pirri bur (*Acaena anserinifolia*) is causing quite a problem. This plant is common amongst the marram on the sand-dunes and in some of the dune slacks. The heads bear hooked fruits, 3-4 in. above the ground, which become attached to the fledglings of small birds such as the Skylark and Meadow pipit. Gradually these birds become so encumbered that they cannot move about and eventually they die. Does this happen in any other parts where the plant occurs, for example in N. Norfolk? We would be pleased to hear of any suggestions of how to deal with this problem.

I hope I have succeeded in making these two counties sound botanically attractive. Even amid what seems to be a lot of squalor and untidiness in east Durham there are some fine botanical areas.

Forced to review the progress of the Northumberland and Durham Naturalists' Trust in its first year, I am somewhat surprised to realize that much of our effort has not been directed towards these highly desirable areas but to the giving of advice to such bodies as the Northumberland Planning Authority on the development of SE. Northumberland, to discussions with the County Surveyors on roadside verge treatment (here progress has been more favourable in Northumberland than in County Durham), and to making contact with the National Coal Board who, under pressure from the National Farmers' Union and others, let the water out of a pond in a S.S.S.I.

However, I believe some progress has been made. The Trust is becoming known and I was greatly cheered recently when the Durham County Planning Authority asked if the Trust had any objections to certain proposed developments.

Now a word of warning to those who advocate the 'preservation by secrecy' policy. Secrecy is a two-edged sword. Our finest area of limestone grassland was almost lost because of this attitude. Any of you who cherish a "special" area must see that it is adequately protected. It is better to risk a small loss due to divulging your secret than lose a whole area because those with planning decisions to make did not know of the botanical interests. Do inform your Naturalists' Trust secretary.

In some cases development plans which will cause the loss of wildlife had already been agreed before the Trust was formed. It is no good crying over spilt milk; such decisions have to be accepted.

I am constantly encouraged by the interest and co-operation of

many bodies and people once they are approached. Many things take time and Trusts must be patient.

My advice to those who deplore the destruction of botanical sites and wildlife is to join your Naturalists' Trust and become an active member; then you will be too busy passively to bemoan the losses.

REFERENCE

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CONSERVATION IN PRACTICE

A. E. SMITH

(Society for the Promotion of Nature Reserves)

THIS paper is principally an account of the Naturalists' Trust movement and a discussion of some of the problems of conservation—particularly those relating to wild plants—with which Trusts are concerned. The history of nature conservation in Britain between the two World Wars was a tragedy of lost opportunities. Charles Rothschild had founded the Society for the Promotion of Nature Reserves in 1912 and it was incorporated by Royal Charter in 1916. In 1915 the Society produced a schedule of 280 areas in England worthy of preservation together with a list of owners. This schedule was submitted by Rothschild in April, 1916, to the Board of Agriculture, who had already displayed sufficient interest in the Society's aims and activities to nominate two representatives to the Council. Had it not been for the War, for the economic crisis which followed, and for Rothschild's ill health and his death in 1923, the conservation movement in this country might by the mid-1920's have reached a position which it in fact took another 25 or 30 years to achieve.

Rothschild's death deprived the S.P.N.R. of its main inspiration, and it failed in the 1920's and '30's to fulfil the rôle in conservation which he had evidently envisaged for it. It might have had a better chance of success if another opportunity had not been lost. In 1926 Dr. Sydney Long and others founded the Norfolk Naturalists' Trust, and at the British Association meeting in September of that year Professor Oliver looked forward optimistically "to the time when every county would have its County Trust". Alas, the Norfolk Trust remained for 20 years a splendid but unheeded example. But to regret past failures is unprofitable and we have in any case done much in the last 15 years to remedy them. The developing stature and influence of the Nature Conservancy, the growth and expanding activities of bodies like this Society (B.S.B.I.) and the Royal Society for the Protection of Birds (R.S.P.B.), the creation of the Council for Nature and the launching of the British Appeal of the World Wildlife Fund have all been important advances on the national front.

Equally impressive has been the rapid expansion of the Naturalists' Trust movement. The Norfolk example was at last followed in 1946 by Yorkshire and two years later by Lincolnshire. After a

further delay of eight years Trusts were established in Cambridgeshire and Leicestershire in 1956, West Midlands in 1957 and Kent in 1958. From then on the movement has gathered such momentum that by the end of 1963 the whole of England and Wales should be covered by Trusts and a start may also have been made in Scotland. It must be remembered that this is a young movement and that many of the problems with which it is dealing are new to us in Britain.

It was inevitable that the Trusts should seek to establish some form of central organization and that this should be achieved through the S.P.N.R., itself designed for just such active work in conservation as the Trusts. The County Naturalists' Trusts' Committee of the S.P.N.R. has provided Trusts with a forum for the exchange of ideas and information, with the means of representing common interests and negotiating with national bodies, and with opportunities for securing grants and loans from national sources.

I need not argue here the need for a voluntary movement in conservation as well as a State organization. The Conservancy themselves have always stressed the need for this. But what is the justification for local voluntary bodies? It was again the Conservancy who gave the best answer to this question when in their Annual Report for 1960–61 they wrote of conservation as "essentially something which must be done by local people with local goodwill and understanding". But were we right to establish new organizations for this purpose and not to rely on the existing natural history societies? I have no doubt that we were. Conservation demands a special organization with special funds. And, even more important, the Trusts are attracting support from many people who do not think of themselves as naturalists but who are concerned about the future of our wildlife and wild places. This, I believe, is the real strength of the Trusts movement: that it appeals to local values and loyalties and is making conservation the concern not only of scientists and naturalists, but of ordinary people in their own countryside.

Most of you are no doubt members of Trusts, some of you are officers. I need not therefore describe in general terms their functions and activities. They have, as I see it, a dual purpose: active conservation—establishing and managing reserves and protecting wild life generally; and through publicity and education helping people to understand and appreciate nature and to give them some sense of responsibility for the natural resources of their land and its wild life. I propose now to examine these functions with special reference to the problems of protecting and conserving wild plants.

The establishment and management of nature reserves is a means of conserving distinctive types of habitat. Trusts are purchasing and leasing reserves and making agreements for their establishment with sympathetic landowners. Thanks to the £25,000 Nuffield Loan Fund and to the Pilgrim Fund, both administered by S.P.N.R., and more recently to the World Wildlife Fund, a good deal of financial aid is now available to Trusts for purchases and they are making good use of it. During the last twelve months reserves acquired by Trusts have included such famous sites as Hayley Wood, the largest remaining example of coppice-with-standard woodland on boulder clay in Cambridgeshire; Downe Bank in Kent, still as rich in orchids as it was when Darwin studied them there; Roydon Common, the best remaining tract of lowland heath and bog on the glacial sands and gravels bordering the Wash in eastern Norfolk. At Cors Goch in Anglesey, a proposed National Nature Reserve, the S.P.N.R. have acquired an area of fen and limestone grassland with a rich variety of plants. This reserve it is hoped will be managed and extended by the new North Wales Trust. Other areas for which negotiations are almost completed are Redgrave and Lopham Fens in Suffolk, the finest unspoilt valley fens in East Anglia; and the eastern section of the carboniferous limestone cliffs between Port Eynon and Rhossili in the Gower Peninsula, Glamorgan, an area with a particularly rich calcicolous flora which includes an unusually large number of rare species. In addition to these and other acquisitions, the Hampshire and Isle of Wight Trust have leased part of Langstone Harbour, another proposed National Nature Reserve. These added to earlier reserves such as Hickling Broad and the Breckland areas in Norfolk, Askham Bog and Spurn Head in Yorkshire, and Gibraltar Point, the Saltfleetby Dunes and the blown-sand heaths in Lincolnshire, make an impressive list of reserves of undoubted national as well as local importance which are now in the care of Trusts.

These are some of the notable achievements in the establishment of nature reserves. Trusts have also been active in other ways, in seeking protection for Sites of Special Scientific Interest and conservation treatment for larger tracts of country, like Ashdown Forest, about which the Sussex Trust made valuable recommendations to the Conservators. And in maritime counties such as Essex, Glamorgan, Hampshire, Kent, Lincolnshire and Sussex, Trusts have vigorously supported Local Authorities in their efforts to protect unspoiled coastlands.

The first aim in selecting reserves—and this applies to Trusts as well as to the Conservancy—is the securing of a representative sample of the best remaining natural or semi-natural habitats in a

county. These incidentally almost always contain rare or localized species of plants, often because they are the last or almost the last examples of this type of habitat to survive. Occasionally Trusts take steps to protect a site primarily for the sake of a rare species. Thus the Dorset Trust has obtained a lease of the site of *Scorzonera humilis* in that county; the Berkshire, Buckinghamshire and Oxfordshire Trust mounts special guard at weekends, during the flowering season, over military and monkey orchid (*Orchis militaris* and *O. simia*) sites; the Lincolnshire Trust has made arrangements to give protection to one of the two or three remaining sites for *Armeria maritima* subsp. *elongata* in the Ancaster district; the Hampshire and Isle of Wight Trust has likewise secured some protection for *Calamintha sylvatica* in the Isle of Wight. There are similar plans afoot in other counties to safeguard rare, interesting and attractive plants.

Trusts, of course, are not concerned only with extensive or spectacular habitat reserves. There is increasing need for small reserves and for the protection of quite ordinary plant associations. This need is particularly marked in those parts of England—notably the eastern counties—where the new agricultural revolution is rapidly destroying not only the last remnants of wilderness, but those small semi-natural features of the old landscape on which the variety of wild nature so often depends—the pond, the copse, the old chalk pit, the hedgerow and hedge bank, the margin of the stream. Several Trusts are now seeking to protect a representative sample of ponds and disused pits which are suffering too from use as refuse tips. Surrey and Cambridgeshire, for example, have made surveys of these as a basis for conservation proposals. In Lincolnshire, where open downland on chalk and limestone disappeared a century and a half ago, the old quarry and the road verge are almost the only places where calcicolous plants can be found. The Lincolnshire Trust has recently acquired two chalk pits on the Wolds and is negotiating for others. Trusts have acquired ponds and disused clay and gravel pits in a number of counties and these usually have an interesting aquatic and marginal flora and, in the case of gravel pits especially, show weed colonization of bare ground. In intensively cultivated country these are now often the best places to find some of the formerly common corn-field weeds.

I have mentioned the fact that Trusts are establishing reserves by agreement with landowners as well as by purchase and lease. The Kent Trust has been particularly successful in this respect, and Leicestershire's finest reserve, 500 acres of woodland and heath in Charnwood Forest, was established by such an agreement. In addition to private owners, the Forestry Commission are nearly

always willing to take conservation interests into account and they have concluded agreements with Trusts in many counties to leave areas unplanted or to retain old trees; and they are now prepared to lease more extensive areas to Trusts as they have done recently in the case of the well-known Grass Wood in Wharfedale. The County Naturalists' Trusts' Committee is now working out with the Forestry Commission the principles on which local agreements can be based. Co-operation is also growing between the National Trust and Naturalists' Trusts and this should be widely extended. The National Trust owns many properties of biological interest where conservation management is needed. A fine example of the kind of collaboration we are seeking to promote is the important help recently given by the Dorset Trust in saving Brownsea Island for the National Trust and now in managing part of it as a nature reserve. I hope that Trusts will also seek to influence the new River Authorities in matters of nature conservation. Their rôle will be of vital importance not only in respect of the flora and fauna of rivers and streams, but also in the extraction of water from rivers and from underground. In many parts of England a falling water table presents one of the most serious conservation problems.

As for Local Authorities, I am sure that we ought to persuade them to use the powers of the 1949 Act to create reserves wherever appropriate Trusts can offer the kind of advice and help in management without which an Authority may be reluctant to proceed. The Gibraltar Point-Skegness Reserve in Lincolnshire, owned by Lindsey County Council and Skegness Urban District Council and managed by the Lincolnshire Trust, provides an excellent example of successful collaboration between Local Authorities and a Trust. Lindsey in particular have taken a notable lead in conservation among County Councils. In Kent the County Council in association with the Kent Trust are now also negotiating to establish a number of Local Reserves.

I cannot attempt to deal here with the problems of the scientific management of reserves which confront a Trust. Most of them have access to specialist advice both amateur and professional and they are carrying out on their reserves an impressive amount of management work almost entirely with voluntary help. And as the Thriplow Meadow experiments in Cambridgeshire show, they are making important contributions to conservation research. We must all be aware of the great stimulus which conservation and reserve management problems have provided for amateur as well as professional botanical and other biological studies.

The example of the Council for Nature's Conservation Corps has been an invaluable pattern for local developments of the same

kind. Voluntary wardening services are also being developed in many parts of the country and are helping to deal among other things with the problems of protecting rare plants. The Nature Conservancy's regional staff are another invaluable source of help and advice to Trusts. An agreement recently concluded by which Trusts will gradually assume many of the non-statutory responsibilities for the S.S.S.I. should enable the Conservancy's Regional Officers to devote more time to advisory services of this kind. But the Trusts need as much advice and assistance as they can get—especially perhaps on botanical problems—and I hope that members of this Society not already doing so will support and assist their local Trust.

There is one particular aspect of reserve management to which I should like to give special attention. It is the problem of the use of reserves for educational purposes and by the general public. Whilst in some ways these two uses are obviously different, they both make an impact on the reserve which we need to assess. As the demand for outdoor study areas and facilities increases we must decide which reserves and sites of interest can safely be used for this purpose and what volume of use is compatible with conservation requirements. We must also consider whether special educational reserves are required. Local Education Authorities, schools, colleges, even universities, should be encouraged to look to Trusts—many of whom have established education committees—for guidance about areas suitable for field studies, and Trusts must have positive proposals ready. The same considerations apply to some extent to public access. When access can be controlled we have to decide which reserves need to be kept as undisturbed as possible and which can withstand some degree of public use. In many cases, of course, we have no option in the matter; public access is a right or a privilege so firmly established that it would be impossible to restrict or prohibit it even if that seemed desirable. In such cases the support of a Local Authority in regulating access through by-laws and other means is often valuable. But in the long run successful conservation in such reserves will depend as much on securing the interest and goodwill of the visiting public as on control and regulation.

Trusts have initiated a number of interesting educational projects—the Leicestershire canal, Conigre Pond, the Brantwood Educational Reserve, the Gibraltar Point Field Research Station. They are also concerned with this more difficult problem of the interpretation of nature for the ordinary visitor to reserves. From the Americans we have acquired the technique of the nature trail which promises to be a useful supplement to the warden-guide

system which many Trusts already use. The most ambitious trail so far mounted in this country was that on Coombe Hill in Oxfordshire in 1962 by the Berkshire, Buckinghamshire and Oxfordshire Trust. Others are being prepared this year for National Nature Week. Another educational medium is the field museum or information centre of the kind to be opened at Gibraltar Point in May, 1963, where visitors can see illustrations of some of the plants and animals and other features of the reserve and where the need for care and observance of regulations and requests can be emphasized. Provision of this kind tends, of course, to encourage visitors and there are some who believe that this is dangerous. Clearly there is a dilemma here, but to protect many of these places against multiplying threats and pressures, to exert an influence for conservation, we need wide public support and we cannot expect to receive this if people do not understand and appreciate the value of what we are trying to do. There are risks in a policy of popularizing the study and enjoyment of wild nature especially in a small, overcrowded country like ours, and obviously we must proceed with caution and discretion; but I am convinced that in the 1960's such a policy offers the only real hope of protecting our wildlife and wild places.

So far I have spoken mainly about Nature Reserves and Scientific Sites. But what of the ordinary countryside and its variety of plants and animals, now suffering drastic impoverishment in many parts of the country? To influence the re-shaping of the landscape and the attitudes of those responsible for it is a much more difficult task than establishing nature reserves. Sometimes it seems almost a hopeless one, but some successes have been achieved. Action by this Society, by the Nature Conservancy and by Trusts has saved our road verges from wholesale spraying. Many Trusts are in close touch with their County Councils regarding the implementation of the national agreement on roadside spraying which the Ministry of Transport concluded with the Nature Conservancy in 1955. Some of them have achieved even more positive co-operation with their County Councils in this matter. In Cambridgeshire, for example, the County Council have invited the Trust to notify them of verges of special interest and to advise them on the re-seeding and experimental treatment of disturbed verges. In Lincolnshire, Lindsey County Council are now marking with posts stretches of verge recommended by the Trust for protection from any form of damage. Leicestershire and other counties are considering similar action. By conservation measures of this kind and by roadside tree-planning schemes County Councils are increasingly concerned with landscape and wildlife values, and I look forward

to the time when every major County Planning Department has an ecologist on its staff.

The problem of the rare plant threatened with destruction by development which cannot be prevented is one which a number of Trusts have encountered. Quite properly in my view they have adopted the policy of transplantation to the nearest suitable habitat. Thus the Hampshire Trust moved plants of the rare Horsetail, *Equisetum variegatum*, which was threatened with destruction in its only known Hampshire station near Southampton. In the Breckland, *Artemisia campestris*, has been transplanted from one of its few sites which was threatened by housing development. It would, I imagine, be generally agreed that transplanting experiments in such circumstances are entirely justifiable. On the other hand introduction of a plant to a new area without some exceptionally good reason of this kind or as a controlled experiment would quite properly be deprecated by most botanists. But what is our attitude to the re-introduction of a species to a nature reserve where it is known formerly to have occurred? If its disappearance was the result of human interference or a change in human activity is it not justifiable to restore it if conditions have again become or have been made favourable for it? Whilst each case of transplanting or re-introduction must be judged on its merits, it would be helpful to have a set of principles on which to base a decision. As the destruction of wild places continues, as threats to rare plants multiply, as more nature reserves are created, these problems will occur more frequently.

Finally I come to the problem of protecting wild plants by law. In all but a very few counties of England there is a bye-law in force which makes it an offence for any person (unless authorized by an owner or occupier, if any) to uproot any ferns or other plants growing in any road, lane, roadside waste, roadside bank or hedge, common or other place to which the public have access. Prosecutions may have been made under these bye-laws, but I have never heard of any. Certainly they are quite unknown to the overwhelming majority of the public and I daresay to many of the Police. Most of them, incidentally, date from the late 1920's and early '30's and were the result of representations made to County Councils and to the Home Office by S.P.N.R. in the first instance and later by C.P.R.E. which in October, 1926, held a special conference on wild flowers at Manchester and in 1931 established a Wild Plant Conservation Board.

In considering legislation the first problem surely is how to make these bye-laws more widely known and effective. There may be much that we can learn here from the efforts to publicize the

Protection of Birds Act. Certainly Naturalists' Trusts working in collaboration with this Society can play an important part in making these bye-laws something more than the dead letter which they now are. Already, at the suggestion of the Trusts' Committee, reference to their existence has been made by a number of Trusts in their bulletins and these references have found their way into the local Press.

Some conservationists are now urging the need for Parliamentary legislation to protect wild plants. The extreme view—and that description is without disparagement—is that the picking as well as the uprooting of all wild flowers should be prohibited by law. In my view this is a completely unrealistic and impracticable demand and one which can only damage the image of the conservation movement. Apart from any other consideration, a law which is as completely unenforceable as that would be is worse than no law at all. I believe that a case can be made for legislation designed to reinforce or replace the local bye-laws against uprooting, to prohibit the sale to the public of the roots of wild plants at least without a landowner's permission, to prohibit absolutely the sale of the roots or flowers of certain rare species, and if possible to enable bye-laws or orders to be made prohibiting the picking and uprooting of plants in non-statutory nature reserves or areas with a rich flora. It may be that this could form part of a more comprehensive wildlife or nature Protection Act.

I have already expressed the view in another context that regulation or prohibition by itself is not enough. It must be accompanied by education and by publicity to attract the interest of the public and to explain why such measures of protection are necessary. Much is already being done in this direction by the national and local conservation bodies especially at nature reserves, but much more could be done through the schools and by the imaginative use of posters. To refer again to the analogy of bird protection, the R.S.P.B. are at present producing posters depicting birds of prey which various Trusts are distributing in their own areas.

The Trusts' Committee have decided to establish a Working Party to consider the general problems of wild plant protection and conservation as they affect Naturalists' Trusts. In doing so they are anxious to have the collaboration of this Society and I hope that we can make this a joint venture.

DISCUSSION

Dr. WALTERS (*Chairman*) decided that the papers by Dr. M. E. Bradshaw and by Mr. A. E. Smith should be discussed together.

Mr. LOUSLEY: Attention should be drawn to the considerable, and not entirely unsuccessful, work devoted to amending and enforcing the bye-laws prohibiting the uprooting of wild plants which had taken place before the war. I recall that two bodies, on which I was serving 30 years ago, were very active in this matter but it now seemed that this important fund of experience has almost been forgotten. In 1931 a most useful report was prepared for the Wild Plant Conservation Board which showed that in some counties the bye-laws were working satisfactorily and having good effect, and convictions were being obtained. In 1933 the Secretary of State received a deputation from the Wild Plant Conservation Board, following which, in 1934, he prepared an amended "model" bye-law to bring within its scope "any kind of plant, whether flowering or non-flowering, which is likely to be a source of temptation to the uprooter of plants". A valuable summary of the position was printed in *Flora's League: Handbook*, (April 1932–March 1934).

Further discussion was postponed till after the mid-morning coffee interval, when Dr. Walters again took the Chair.

FINAL DISCUSSION

Dr. WALTERS (*Chairman*): I think it is evident that this Conference has exceeded the hopes of the organizers, and I think it indicates that the B.S.B.I. as a whole is concerned about the topic of nature conservation, particularly as it applies to the vascular flora of the British Isles, and feels the responsibility to tackle some of these urgent and complex problems we have been hearing about.

I would like the discussion to be rather severely practical, although it will have to be general at the same time, and I should hope that from it will arise suggestions as to what this Society in particular should do about some of the problems we have been discussing. May I first draw out and mention one or two of these? Firstly, the thing which affects a great many members of this Society and, in fact, the relations between bodies like the Botanical Society and Naturalists' Trusts, is the responsibility of botanists and naturalists as a whole to support conservation activities and if necessary to criticize conservation activities which are pursued either by official or unofficial bodies. I think we are at a stage where constructive criticism—even adverse criticism—is required from competent naturalists. There are County Trusts where the representation of expert botanical opinion is inadequate and it is up to us all to see that this situation is rectified as far as it lies within our power to do so. The Nature Conservancy itself would be the first to recognize, officially and unofficially, that none of its activities are without defects and possible criticism.

The second thing which has come out of this Conference, very forcibly I think, is that we are at a stage where the development of education for conservation is particularly timely and urgent. There are whole complexes of problems here which affect this Society and botanists in particular. Ornithologists dominate in terms of sheer numbers, but it is indeed up to the botanists to remind the ornithologists and entomologists too that the root problems of conservation are the conservation of habitats, and habitats are made up very largely of vascular plants. We have to face the responsibility in these things and in some ways I think we are not unaware of them. I hope we may be able to be more effective, both locally and nationally.

I think we should also consider what particular efforts by this Society along more traditional lines are appropriate to problems of conservation. Two come to mind from things speakers have mentioned and several have arisen in discussion. Firstly, there are the numerous opportunities which have arisen for the study of changing floras and changing vegetation patterns in these very large forest conditions. We have just heard that virtually one-tenth of Northumberland is owned by the Forestry Commission. It is forest established from scratch and this next generation will have a great opportunity not only in scientific recording of changes in vegetation but also in determining the pattern in forestry and forest reserves in this country. Secondly, and again along traditional lines, is that effort could

well be organized by this Society to make sure that none of the rarities of this country are without some form of protection. The question of how this should actually be done is the concern of the Conservation Committee of this Society, but Members' suggestions of how this should be done, either coming through County Trusts or as individuals, are very important.

The other continuing activity which I am sure the Conservancy and the County Trusts would particularly stress is the importance, in the increasing numbers of Nature Reserves, of studying and recording change, particularly change which is affecting rare or local species. There are projects of this type which in some cases have been going on for some years, but, on the whole, we are not tackling this problem as adequately as we might.

Finally I would like to remind you of Mr. Smith's point concerned with the whole problem of how to conserve a rarity we fail legally to protect. Are we justified—and under what circumstances are we justified—in transplantation experiments, in the recorded introductions and the whole complex of problems which are attendant on these activities?

I hope this is a sufficient introduction of some of the fields of discussion it may be possible to cover.

Mr. FITTER: May I make two points? Firstly, I have personal experience of wardening sites where rare plants grow. In one site the request for wardening came from the landowner, worried by the large numbers of people visiting his site; but there is a dilemma here—a succession of voluntary wardens on a site of a rare plant is one way of extending the knowledge of the existence of that site very rapidly, and so, indirectly, endangering the plant it is intended to protect. Secondly, I believe the main effort in conservation of plants should be by education rather than by legislation. Educate the public along the lines "leave plants for others to enjoy".

Prof. VALENTINE: The use of mass media in informing the public is best done through film and television. There are few botanical films—most nature films are about birds and animals. There is a need to stimulate the production of good short films dealing with vegetation and plants and I commend this to the Nature Conservancy and the Conservation Committee of the B.S.B.I.

Mr. MILNE-REDHEAD: There is an official film of the Royal Botanic Gardens, Kew, showing various aspects of its work, but this film, made by an independent producer, is not allowed to be shown on the circuits in this country. One has to see it in a club or society or somewhere abroad. Here is an interesting botanical film wasted as a means of educating the people of this country.

Dr. WALTERS: A film dealing with the problems of conservation and the work of the Nature Conservancy has been made by the National Benzole Co. Ltd.*

Dr. ASHBY: It is difficult to get hold of films. This must be made easier.

* "The Living Pattern" (30 minutes). Loaned free by Petroleum Films Bureau, 4 Brook St., London, W.1.

Mr. FITTER: The Council for Nature keeps a list of natural history films. That dealing with the British Isles costs 2s. 6d. and that with the rest of the world 2s.

Mr. MOXEY: The film entitled "London Birds" produced by the London Natural History Society, is being widely shown in schools and to private audiences. I wonder if the B.S.B.I. might not think along similar lines. Since the bulk of conservationists are ornithologists, why not cash in on this by emphasizing habitats rather than rare plants? After all, as conservationists we ought not to be merely botanists or ornithologists, but ecologists.

Mr. WILKS: In Kent a nature film for television has been made by Independent Television. A warning is necessary, however. The television camera people must be told in advance what kind of things they are expected to photograph, because in Kent they came to photograph orchids without any close-up lenses! The television people were very easy to work with; they arrived with the inevitable series of vehicles but the equipment proved to be very portable and they were able to take photographs of flowers *in situ* with very good results.

May I, also, refer to Dr. Bradshaw's horror at finding 50 or more people on one occasion* in Upper Teesdale:

I share the horror, but I must remind the Conference that this shows up the problem we have in Kent in a very fair perspective. In Kent we are not concerned with 50 people at the same time in one small area but with tens of thousands. From Greater London there are many hundreds of coaches per hour bringing day trippers into the county, as well as thousands of cars. Road access by motor vehicle now means that these tens of thousands of people deploy themselves all over, even the remoter parts of the county. At Sandwich Bay, for example, one of the richest botanical spots in Kent, it is nothing to find 10,000 people on a Saturday or Sunday during the late Spring and Summer. The problems of preservation and conservation in Kent are now of the utmost urgency and the pressure is such that it is possible that those who live outside the home counties just cannot credit what we have to put up with.

Dr. BRADSHAW: The quality of some amateur films is excellent, but some of the producers need guidance on what to photograph and how to edit the film.

Mr. MILNE-REDHEAD: I would like to know how one gets the independently made films into the circuits, so that they are seen by the ordinary film-goers. Much is lost on television through lack of colour. The problem of getting good independently produced colour films of natural history subjects into the circuits should be taken up at a high level, if that is at all possible.

Dr. PERRING: There are 143 species of vascular plants which exist in five or fewer 10-kilometre squares, that is 10 per cent of our native flora! These should all receive protection. Where locally the botanical knowledge for the best treatment for the protection of any of these rare species is not adequate, advice should be sought from some central body, such as the

* This was on a "miserably cold Sunday" in May.—Ed.

Nature Conservancy. I would like to see a preliminary list of species prepared which all B.S.B.I. Members would agree not to collect; in the event of any proved infringement of this, and membership would be withdrawn. Permission would be given for collecting on scientific grounds only if absolutely necessary. If we are to appeal to the general public and ask support of members of parliament, we would be on a much stronger footing if we could show that we are taking active steps to protect our rare flowers. It would be unfortunate if the conservation posters be interpreted as "Please leave the flowers for us to pick"!

Dr. BRADSHAW: I think there is an advantage to be gained by setting a good example. Mr. Holmes has shown us that conservation work can often be continued with ordinary field work. If biology teachers take back to the habitat material which has been surplus to their requirements, it could be a great help and create a good impression on the people they teach. I consider there is a case for cultivating some wild plants in the school grounds for future use, so that material may be available for classes without collecting it from habitats in the wild. A second point I would like to mention is that rare and uncommon plants seem to be disproportionately attractive to research workers and writers of the "Biological Flora". I hope that directors of research will consider carefully the methods to be used and will avoid large collections of plants being made to provide impressive sets of figures. It would be a pity if we ended up with a set of figures, but no plants!

Mr. GRANT ROGER: The habitats of animals depend on vegetation, particularly woodland. I consider that a great deal of attention should be paid to this fundamental plant conservation as a basis for animal conservation. Another point I would like to make is that, over 30 years of leading parties (both of school children and of university students) in the field, I have noticed less and less collecting of plants and more and more note-taking, drawing and taking of photographs. Those interested in conservation must seriously consider the very great danger to vegetation and wildlife due to fire, grazing and use of toxic chemicals. It is not only rare and local plants that need conservation. I put forward a plea for the conservation of many of our common plants before they become rare.

Mr. LOUSLEY: I am impressed by the many important things which have been said but I have time to elaborate on only one of them. Mr. Hemsley has urged naturalists to re-orientate their thoughts to a positive approach in place of the purely negative one which is at present all too common. I think that conservation work has now reached a critical stage when much of our effort should be redirected on positive lines.

Up to now we have been concerned mainly with saving existing floras from destruction. Many of the habitats which Trusts have acquired as their first properties, or taken steps to conserve, are places which followed human activity they would have deplored. The quarries, gravel-pits, canals, abandoned railways and the like, resulted from destruction in the past, and now we are trying to save a stage in their recolonization. It is illogical to save one gravel-pit and to oppose all applications to dig new ones—such applications should only be opposed when important losses are

involved. There is a good case for encouraging the digging of new quarries and pits with a view to taking them over and studying the colonization at a later date. Dr. Bradshaw has given one example of taking over such an area. One of the most hopeful signs that influential thought is at last turning in this direction is the suggestion in the Nature Conservancy's report on the Broads that consideration should be given to digging out new Broads which, in time, would become as interesting as the old ones.

Many of our most interesting habitats are stages in the succession unlikely to remain of interest for long without skilful and expensive management. For some rare plants it may be more hopeful to create suitable new habitats near to the present ones, into which they may move by natural dispersal, rather than to fight a losing battle in trying to put the clock back. Conservation so far has been mainly a series of emergency measures to counter immediate threats. We would do better to work on positive lines, to study our habitats, and, in appropriate cases, to provide the right conditions for a varied and interesting flora to move in on its own. This may take longer to show results but it will provide opportunities for scientific study and is likely to be more lasting in the end.

Mr. BELLAMY: Mankind needs to live with nature and not bully it out of existence. To take an example from my own researches, the world content of carbon dioxide is going up; not enough is being absorbed by the oceans. If this increase continues indefinitely it can only result in the destruction of nature and of man.

Mr. WESTRUP: The International Union for the Conservation of Nature is engaged on the problem of conserving some of the wetlands of the world. In Britain we have few wetland areas compared with some other countries, so it is all the more important to save such as we have. Official policy seems to be to run water straight into rivers and thence into the sea, and to draw water from the land and so lower the water table. Such policies are leading this country into becoming a desert.

Mr. BELLAMY: We have heard, during this Conference, of a number of habitats and localities of rare plants which are practically unknown in the literature and which are in danger of being wiped out through ignorance. Now we have our maps of the distribution of species, isn't it time we had our maps of ecological habitats or units? Also I feel it is time Universities got down to a basic ecological survey of this country—we may be the best botanized country in the world, but we know very, very little about our ecology as yet. It is time some University at least turned back to resurvey this country, so that, if we are to lose what we have still got, we do at least know what was there.

Mr. CURRIE: I am glad of this opportunity to make a point which has not been stressed at all at this Conference. We've heard a lot about the education of the public; I wonder what is being done about the education of agriculturalists, and I'm thinking particularly of the agriculturalists in the research and advisory realm. I find there is very little sympathy with or understanding of the principles of conservation, at least in Scotland. There is equally as little in the Forestry Commission in their programmes of planting; the same probably applies in England. Their whole work

includes a fair degree of research on toxic chemicals, dalpon, DCA bracken control, drainage, bog-run. But the question of conservation of habitats is never raised. The results of this research are largely applied in giving advice to people and ultimately this advice is passed on to farmers and landowners. But the principles of conservation are not included in any of the advice which is passed over. I wonder if anything has ever been done in order to tackle this problem. I feel that a really clear and well-reasoned case for conservation must be presented to research workers in agriculture and other related activities. The whole aim of their activities is to increase profits, and this aim may seem often to be in conflict with the aims of conservation. There is a good case here for carrying the work of conservation education into the ranks of the research and advisory people.

Mr. WAY: The toxicity of any agricultural chemical is assessed firstly in relation to human beings and secondly to a range of laboratory animals, but rarely, if ever, to plants other than crop plants or weeds. There are two main groups of toxic chemicals—those that produce acute and immediate poisoning and those that persist and build up in the body to produce chronic poisoning. It is with the ecological effects of this latter kind of poisoning that we are chiefly concerned in the Toxic Chemicals Section of the Nature Conservancy: that is, with the whole chain of events from the application of the chemical to plants or to the soil through the various insects and herbivores that live on them, to the carnivores and carrion eaters at the head of the food chain. One of our principal problems lies in defining what is the “normal” state before we can say what abnormalities have been caused by the use of agricultural chemicals. There are big gaps in our knowledge of what the normal state is, even in the simplest habitats, and it is in this work that the activities of members of the B.S.B.I., by careful observation and recording, can be of the greatest value.

Mr. HEMSLEY: I was brought up to believe that, though destruction of a habitat was to be deplored, there were always propagules available, which, given satisfactory conditions, and provided certain destructive agents were removed, would enable a plant to come back into the habitat. This situation is however changing and, most of all, the availability of material to stage a comeback is decreasing. One of the greatest needs at the present moment is for the preservation and development of these small areas where we could hope for a natural supply of the propagation material. For instance, why should not the chalk workings become a source of supply of chalk-loving species, and so enable them to colonize suitable sites nearby? We already have recreational, educational, research and protecting reserves. I now suggest that we should have reserves for stock-banks of genetic material. Such reserves should not be too difficult for Trusts to obtain now, but, if the present rate and pattern of change in the countryside continues, even these may go.

Mr. MILNE-REDHEAD: Firstly, I appeal to members of the B.S.B.I. here today, if they are not already doing so, to support their local Naturalists' Trusts. The countryside is our playground; the subscription to our Naturalists' Trust is our entrance fee to the countryside. It is the responsibility of every member of the B.S.B.I., who goes into the country to study

and enjoy the flora, to subscribe to his Naturalists' Trust and if he does it by covenanting he will help the Trust even more.

Secondly, I would like to propose a Resolution, namely:

That this Conference resolves that a working party be set up, composed of representatives of the B.S.B.I., the S.P.N.R. Naturalists' Trusts' Committee and the Council for Nature, to consider certain urgent educational and legal problems concerning the conservation of the British flora.

Dr. BRADSHAW: I am pleased to second this Resolution.

(As there were no amendments and no opposing or dissenting votes, the Resolution was carried unanimously.)

Dr. WALTERS: The matter of the composition of this *ad hoc* committee can be left to the Councils of the B.S.B.I., the S.P.N.R. and the C. for N. It remains for me to say personally how much I have appreciated and enjoyed this conference and to express again on behalf of all of us our thanks to the University authorities here, to the Warden and Council of the Durham Colleges for their hospitality, to Professor Valentine and, in particular, to Dr. Bradshaw, for all the hard work which she has done behind the scenes. Together they have really made this Conference a striking success for the Society as a whole. I very much hope it will be possible to publish the proceedings of this Conference in a suitable form, and we are actively engaged in exploring the best way of doing this. One point which seems very relevant here is that speedy publication is necessary. Many of the talks we have had would lose a lot in their value if they were not available to members and indeed to a wider circle of people in the very near future.

The Conference closed with loud applause for the sentiments expressed so ably by the Chairman.

CONFERENCE PROGRAMME

CONSERVATION OF THE BRITISH FLORA

Friday, 19th April 1963

Chairman: Mr. J. E. LOUSLEY

- 10.00 a.m. Introductory remarks
10.05 a.m. Afforestation and conservation in Northumberland
Dr. W. A. CLARK
10.50 a.m. Interval for coffee
11.10 a.m. Conservation and land use with special reference
to the Moor House National Nature Reserve Mr. A. EDDY
11.50 a.m. Progress in conserving the Scottish Flora Mr. J. G. ROGER
12.30 p.m. The Work of the Northern Naturalists' Union
Mrs. A. N. GIBBY
1.00 p.m. Interval for luncheon

Chairman: Prof. D. H. VALENTINE

- 2.15 p.m. Conservation in South and South-West England
Mr. J. H. HEMSLEY
2.55 p.m. The herbarium botanist and conservation Dr. D. H. DALBY
3.40 p.m. Interval for tea
4.05 p.m. Conservation in an educational Nature Reserve
Mr. P. F. HOLMES
8.15 p.m. Exhibition Meeting and Soirée

Saturday, 20th April 1963

Chairman: Dr. S. M. WALTERS

- 9.30 a.m. The Northumberland and Durham Naturalists' Trust
Dr. M. E. BRADSHAW
10.00 a.m. Conservation in practice Mr. A. E. SMITH
10.50 a.m. Interval for coffee
11.15 a.m. Final discussion
2.15 p.m. Field excursion to Cassop Vale and Castle Eden
in the magnesian limestone areas of eastern
County Durham

NAMES OF THOSE WHO ATTENDED THE CONFERENCE

Agar, J., Mrs.	Fitzgerald, R. D., Mr.	Rob, C. M., Miss
Alvin, K. L., Dr.	Frankland, H. M. J., Dr.	Roger, J. G., Mr.
Applegarth, R., Mr.	Gay, P. A., Dr.	Rogers, S., Dr.
Ashby, K. R., Dr.	Gibbons, E. J., Miss	Russell, B. H. S., Mrs.
Baldry, E. J., Mr.	Gibby, A. N., Mrs.	Sandell, R. E., Mr.
Batey, A., Miss	Gore, T., Mr.	Scaling, T. N., Mr.
Bellamy, D. J., Mr.	Graham, G. G., The Rev.	Simmons, C., Mrs.
Bowen, H. J. M., Dr.	Hall, D., Mr.	Simmons, I. G., Dr.
Bowerman, A., Miss	Harley, R. M., Mr.	Smith, A. E., Mr.
Bowerman, L. T., Mr.	Harley, A., Mrs.	Smith, A. J. E., Dr.
Bowerman, L. T., Mrs.	Harrison, S. G., Mr.	Smith, G. L., Mr.
Boyd-Watt, W., Mrs.	Harvey, M. J., Dr.	Sommerville, A. H., Mrs.
Bradshaw, M. E., Dr.	Haw, M., Miss	Sowerby, W. B. H., Mr.
Briggs, M., Mrs.	Hemsley, J. H., Mr.	Stansfield, G., Mr.
Browning, L., Miss	Hepper, F. N., Mr.	Stirling, A. McG., Mr.
Bullard, E. R., Miss	Hodgson, J. M., Miss	Streeter, D., Mr.
Burnip, M., Mrs.	Holmes, P. F., Mr.	Swan, G. A., Dr.
Burns, A., Miss	Hudson, M. J., Mr.	Swan, G. A., Mrs.
Clark, W. A., Dr.	Jermy, A. C., Mr.	Sykes, M., Mrs.
Crompton, G., Mrs.	Labern, M. V., Mr.	Taylor, M. E., Miss
Crosby, J. L., Dr.	Lawrence, I., Mr.	Taylor, N., Miss
Currie, A., Mr.	Lobley, E. M., Miss	Thakur, V., Mr.
Dalby, D. H., Dr.	Lousley, J. E., Mr.	Thomas, S., Miss
Danby, C., Mr.	Lowe, Mr.	Thompson, J., Mr.
Dony, C., Mrs.	Magee, L., Mr.	Thompson, K., Mr.
Dony, J. G., Dr.	Mason, E., Mr.	Todd, A., Dr.
Douglas, C. C. E., Mr.	Maycock, R., Mr.	Torrance, W. G., Mr.
Downer, C. S., Mr.	McClintock, D., Mr.	Tynan, T., Mr.
Ducker, B. F. T., Mr.	Milne-Redhead, E., Mr.	Tyson, M., Miss
Duncan, A. C. M., Mr.	Moses, P., Mrs.	Valentine, D. H., Prof.
Duncan, J. E., Mrs.	Moxey, P. A., Mr.	Walters, S. M., Dr.
Dunn, T. C., Mr.	Newtown, A., Mr.	Way, J. M., Mr.
Dupree, T. W. J. D., Mr.	Pearson, D., Miss	Wells, T. C. E., Mr.
Eddy, A., Mr.	Pearson, J., Mrs.	Westrup, A. W., Mr.
Eddy, E., Mrs.	Pearson, P. L., Mr.	Whitton, B., Mr.
Elliott, J., Mrs.	Perring, F. H., Dr.	Wilks, H. M., Mr.
Elliott, R. J., Dr.	Pickering, D., Mr.	Winn, P., Miss
Erskine, S. E., Mrs.	Prestt, I., Mr.	Woodward, W. B., Mr.
Firrell, P. A., Miss	Puttee, P. S., Miss	Woropay, O., Dr.
Fitter, R. S. R., Mr.	Radford, A., Miss	Woropay, O., Mrs.
Fitzgerald, J. W., Mrs.	Ritchie, R., Mr.	

In addition to the above, the four following schools provided parties of students totalling 25:

Chester-le-Street Grammar School	4
Gateshead Grammar School	5
Middlesbrough St. Mary's Convent School	11
Monkwearmouth Grammar School	5

Of the 122 individuals attending, 62 (or 51 per cent) were members of the B.S.B.I. and at least 38 (or 31 per cent) were known to be members of a Naturalists' Trust, and 70 (or 57 per cent) came from farther afield than NE. England.

SUMMARY OF THE EXHIBITS

A Soirée and Exhibition Meeting was held in the University Science Laboratories on the evening of Friday, 19th April. The following is a brief account of some of the exhibits.

The work of the B.S.B.I. Conservation Committee—F. N. HEPPER.

This liaison committee between the B.S.B.I. and the Nature Conservancy meets twice a year and the exhibit showed by means of a large map of Great Britain the localities which have been considered for one reason or another between 1958 and 1963. Interesting sites threatened by some kind of development were most frequent in the south of England. Photographs illustrated the commoner types of threat to such sites.

Northumberland and Durham Naturalists' Trust

A display showing the functions of the Trust was exhibited with the object of enrolling further members.

The Nature Conservancy (England and Wales)

A large wall map of England displayed every area under the jurisdiction of the Conservancy. National Nature Reserves and Sites of Special Scientific Interest were apparent in all parts of the country and demonstrated the extensive interests of the Conservancy in habitats of widely different types.

Distribution of the British species of *Euphrasia*—F. H. PERRING

Maps prepared for the Supplement to the *Atlas* were shown.

Are These Plants Adequately Protected?—F. H. PERRING

Map showing the distribution in Britain of 143 species which occur in 5 or fewer 10-km. squares (excluding the Channel Isles). This map indicated that in almost every county there was some species in this category, and the question was asked "Are you sure that these plants are adequately protected?" (see pp. 73–74).

Erosion in Upper Teesdale—B. WELCH and M. E. BRADSHAW

The exhibit consisted of a number of colour transparencies showing erosion of the sugar limestone area of Cronkley Fell. These included one area where the turf is known to have been destroyed in 1961, a

close-up view showing the break-up of the turf and exposure of the grass roots and the almost complete burial of plants with wind-blown limestone granules. Transparencies of individual plants showed their extreme smallness in this habitat.

Collectors' Misgivings—A. C. JERMY

Old herbarium specimens of rare species were exhibited together with various remarks by the collectors and the present status of the species.

Vegetation of Moor House National Nature Reserve—A. EDDY

This exhibit illustrated the paper read at the Conference (see p. 19).

A Land Use History of Dartmoor—I. G. SIMMONS

This exhibit outlined some of the factors affecting the ecological history of a British upland, man being one of the most important of these factors. A generalized pollen-diagram was shown above the actual diagrams from which it was compiled, and alongside it the length of operation of factors such as disforestation, peat growth, burning, and grazing was plotted, the evidence for these having come from the pollen diagrams and other sources. From these diagrams tapes led to photographs showing the present-day consequences of these influences.

The Nature Conservancy in Scotland—J. GRANT ROGER

The exhibit included photographs and maps of Nature Reserves in Scotland; also publications relating to plant communities and species of special interest found on Scottish Nature Reserves.

Conservation of Bryophytes—A. J. E. SMITH

The exhibit, using selected bryophytes and distribution maps, was designed to show the causes of the loss or decrease of certain species in Great Britain and the need for the conservation of other species growing in localities outside their normal British range of distribution.

The species chosen were: *Cyclodictyon laete-virens*, deliberately exterminated in the only known British locality to enhance the value of existing herbarium specimens; *Grimmia unicolor*, a slow growing species exterminated by over-collecting; *Helodium blandowii* and *Paludella squarrosa*, exterminated by the drainage of bogs; *Orthotrichum obtusifolium*, an epiphytic species once widespread but adversely affected by atmospheric pollution, now known from only

one locality; *Thamnium angustifolium*, in danger of extinction by the activities of picnickers; and *Preissia quadrata* and *Reboulia hemisphaerica*: although common in certain parts of Britain there is only one known locality of the former in the Oxford area and one of the latter in East Anglia.

In addition to the above, J. E. DUNCAN showed the effects of grazing on Ilkley Moor, P. L. PEARSON some aspects of the cytotaxonomy of *Chrysanthemum leucanthemum*, and exhibits were staged by the following bodies, showing the scope of their activities.

Council for Nature

Society for the Promotion of Nature Reserves

International Union for the Conservation of Nature

National Lending Library

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